THE EFFECTS OF FERTILITY AND MALE LABOR SUPPLY ON FEMALE LABOR FORCE PARTICIPATION IN DEVELOPED AND DEVELOPING COUNTRIES

By

Sumaila ZUBERU

THESIS

Submitted to

KDI School of Public Policy and Management,

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MASTER OF DEVELOPMENT POLICY

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ABSTRACT

THE EFFECTS OF FERTILITY AND MALE LABOR SUPPLY ON FEMALE LABOR FORCE PARTICIPATION IN DEVELOPED AND DEVELOPING COUNTRIES

By

Sumaila Zuberu

In any economy the more females get involved in economic activity of any kind, the brighter the chances of that economic to grow rapidly. Female involvement in the labor market enhances their economic power as well as nation's economic growth, but there are factors that affect the participation rate. Fertility and male labor supply are a few of those factors.

This study tried finding out the short run and long run effects of fertility and male labor supply on female labor market involvement using a full sample of 196 developing and developed countries and a sub sample of 130 developing countries between 1974 and 2013. It further found out if there are significant difference(s) between Sub Saharan Africa and other developing countries.

The study reveals that fertility has a significantly adverse effect on female labor market involvement in developing countries and a minor effect in developed countries both in the short and long run. Another finding of this research is that male labor supply rate has a significant positive impact on female labor market involvement in the short run both in developed and developing countries but not in the long run. Fertility has a major adverse effect on female labor market involvement in Sub Saharan Africa and an adverse but insignificant effect in other developing countries in the short run. However the results is different in the long run where fertility has insignificantly negative impact in Sub Saharan Africa but has significantly negative impact in other developing countries. Male labor force participation positively affects female labor market involvement in developing countries in the short run.

요약

출산율과 남성 노동공급이 선진국과 개발도상국의 여성 노동시장 참여에 미치는 영향

수마일라 주베루

어느 노동시장의 맥락에서든 여성의 경제참여가 높아질수록 빠른 경제성장의 가능성 또한 높아지게 된다. 여성의 노동시장 참여는 본인의 경제력을 향상시킬 뿐만 아니라 나라전체의 경제성장도 증대시킨다. 하지만 이러한 여성 경제참여율에 영향을 미치는 여러 요소가 존재하는데, 그 중 출산율과 남성 노동공급을 조사할 필요가 있다.

본 연구는 1974-2013 년을 표본기간으로 설정하고, 196 개 선진국 및 개발도상국 표본과 130 개 부표본을 이용하여 출산율과 남성 노동공급이 여성 경제참여율에 미치는 장 단기적 영향에 대해서 분석하였다. 또한, 사하라 이남 아프리카와 다른 개발도상국간의 유의미한 차이의 여부에 대해 조사하였다.

연구 결과, 개발도상국의 경우 출산율은 여성 노동시장참여에 지대한 부정적 영향을 미치는 반면 선진국의 경우 여성 노동시장참여에 미미한 영향을 주는 것으로 드러났다. 또한, 남성 노동공급율은 선진국과 개발도상국의 여성 노동시장참여에 단기적으로 지대한 긍정적 영향을 주지만 장기적으로 볼 때의 결과는 다른 것으로 드러났다. 특히, 출산율은 단기적으로 볼 때 사하라 이남 아프리카의 여성 노동시장참여에 중대한 역효과를 양산하지만 다른 개발도상국의 여성 노동참여에는 부정적이지만 근소한 영향만을 미치는 것으로 확인할 수 있었다. 하지만, 장기적으로 볼 때, 출산율은 사하라 이남 아프리카의 여성 노동시장참여에 근소한 영향을 미치는 반면 다른 개발도상국의 여성 노동시장참여에는 지대한 부정적 영향을 끼치는 것으로 드러났다. 따라서, 남성 노동시장참여는 개발도상국의 여성 노동시장참여에 단기적으로 긍정적 영향을 주는 것을 알 수 있었다.

DEDICATION

This research is dedicated to the Almighty God for giving me good health and sound mind throughout this course, to the South Korean Government for making it possible for me to study in South Korea, to my family especially to my caring Mother, my lovely wife, my daughter Iman Tipagya and my unborn son. I also dedicate it to Professor Shu Chin-Lin, Professor Shin Jaeun and Professor Yun Hai-Young and to all KDIS staff especially Capacity Building Center and Academic Affairs Division.

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LIST OF ACRONYMS AND ABBREVIATIONS

BR:	Birth Rate
FE:	Fixed Effect
FLFP:	Female Labor Force Participation
MLFP	Male Labor Force Participation
GDP:	Gross Domestic Product
GSL:	General Least Square
ILO:	International Labor Organization
IV:	Instrumental Variable
ODCs	Other Developing Countries
OECD:	Organization for Economic Co-operation and Development
OLS:	Ordinary Least Square
RE:	Random Effect
RM:	Restricted Model
SSA:	Sub Saharan Africa
TBR:	Total Birth Rate
TFR:	Total Fertility rate
URM:	Unrestricted Model
WDI:	World Development Indicators
2SGM:	Two Sample Group Mean
CPI	Consumer Price Index

CHAPTER ONE

1.0 INTRODUCTION

1.1.0 Background

Empirical evidence hints that birth rate has an adverse impact on female involvement rate in the labor market and this impact varies according to geography, socio economic and other factors. This leads to the main purpose of this research which aims at investigating the effects of fertility and male labor supply on female labor market involvement rate in developed and developing countries, and also finds out whether there are differences among developing countries and the factors responsible.

Mincer (1963)[1] and Cain (1966)[2] are the main brains behind the economic hypothesis of female labor force participation which has since been given much attention by other researchers[3]. Female employment rate has become an indicator of welfare of countries and governments will strive to cater for the welfare of its citizens especially women. Increased female involvement in the labor market has acted as a catalyst in the development of many developed economies and thus any improvement in the involvement rates of females in the labor market indicate a country's ability to grow faster. However several factors affect labor market involvement rates and fecundity/fertility is a major factor among several other factors. Male labor market

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1 Mincer Jacob, *Market prices, opportunity costs and income effects: In Measurement in Economics*. Edited by Christ et al. (Stanford, Calif.: Stanford University Press, 1963).

2 (1) Cain, G. G. and M. D. Dooley (1976), Estimation of a Model of Labor Supply, Fertility, and Wages of Married Women, Journal of Political Economy, Vol. 84, No. 4, pp. S17999.
(2) Current investigation on female labor market involvement in Turkey such as that of Kasnakoglu and Dayioglu (1996), Tunali (1997), Özar and Senesen (1998).

3 Aysit Tansel, "Economic Development and Female Labor Force Participation in Turkey: Time-Series Evidence and Cross-Province Estimates", *Journal of Economic Literature,* (2001): 2

involvement can be seen to be competing against female employment because they may be close substitutes. In recent years, economists have paid attention to fertility rate which is considered as one important factor that influences economic growth. It can affect economic growth in a number of ways which include its impact on female labor market involvement rate, decreasing physical capital by raising population and eventually reducing GDP per capita. It is also said to be associated with lower levels of human resource accumulation through low level of education attainment and low quality of health, and thus reduces the speed of economic growth. Thus the connection of women labor market involvement, birth rate (BR) and male labor supply is very important and needs further investigation as this affects female employment rates. The conception of birth rate response is the surmise that so many activities that needs human time are incompatible, indicating that too many responsibilities cannot be undertaken at the same time[4]. If one has total time T available, and spends T_w working for a salary, then the time available for household work, T_h is $(T - T_w)$. Where the individual is working in an organized labor market setting, this is a satisfactory hypothesis which agrees with the mutually exclusive activities assumption that states an adverse association of total birthrate with women involvement in the labor market due to the difficulty in executing the duty of a worker and child caring. It is argued that higher TFR can have two contradictory influences on FLFP.[5] One of which is the fact that childbearing and caring for young children requires a lot of time and work at home and this may

[4] Edward Bbaale, "Female Education, Labor-force Participation and Fertility: Evidence from Uganda", *African Economic Research Consortium, Nairobi-Kenya* (2014): 6

[5] Vinod Mishra, Ingrid Nielsen and Russell Smyth, "The Relationship between Female Labour Force Participation and Fertility in G7 Countries: Evidence from Panel Cointegration and Granger Causality" *Monash University Discussion Paper 13/06*, (2006): 3.

force mothers to stay out of the labor market[6]. Contrarily, child caring is very expensive and demands a lot of money which may force mothers to work to cater for the needs of their children[7]

Using data on 196 advanced and less advanced countries over the period 1974-2013, we find that birth rate has an adverse effect on female involvement rate in the labor market in advanced and less advanced countries, but it has a major impact in less advanced countries and a minor impact in advanced countries. The study also reveals that male labor market involvement has a significant positive effect on women involvement in the labor market in both advanced and less advanced countries in the short but not in the long run. It further reveals that fertility effect on FLFP differs in SSA and ODCs in the short and long run, and that MLFP has a positive relationship with FLFP rate in the short run both in SSA and ODCs. The evidence is robust to alternative model specifications (i.e., different sets of control variables) and regression methods.

1.2.0 Motivation of the Study

The research's motivation stems from the problem children poses on women in their quest to seek jobs besides being home makers. Developed countries have experienced this phenomena and have strived to solve it. Does fertility have the same effect in developing countries context with the availability of helping hands? Should developing countries follow the same footsteps as developed countries in reducing the adverse effect of childbirth on their mothers work life? Does male labor force participation compete with FLFP? The motivation of this research is to add knowledge to academia on these issues.

[6] Ibid.
[7] Ibid.

1.3.0 Study Hypothesis

Based on previous research there seems to be an inverse relationship between birthrate and FLFP. An a priori statement of an inverse relationship between FLFP and that of male labor market participation may be true because an increase in male labor market participation may reduce jobs available for females theoretically. The following are the hypotheses of the study:

Hypothesis A

H0: The effect of fertility on FLFP is the same for both advanced and less advanced countries.

H1: The effect of fertility on FLFP differs between advanced and less advanced countries.

Hypothesis B

H0: The effect of fertility on FLFP is the same in SSA and ODCs.

H2: The effect of fertility on FLFP differs in SSA and ODCs.

Hypothesis C

H0: Male labor supply reduces FLFP in advanced and less advanced countries.

H1: Male labor supply increases FLFP in advanced and less advanced countries.

Hypothesis D

H0: The effect of Male Labor Force Participation on FLFP is the same in SSA and ODCs.

H2: The effect of Male Labor Force Participation on FLFP differs in SSA and ODCs.

1.4.0 Problem Statement

Female participation in the labor market enhances their economic power as well as nation's economic growth, but there are factors that affect the participation rate. Fertility and male labor force participation are a few of those factors. Male's involvement in the labor market may be thought to be associated with a reduction in women labor market involvement due to substitution effect as well family decisions. There seems to be little or no comparative study on

fertility effects on female and male labor market involvement in the short and long run. Even though there are a lot of studies on the effects of fertility on female labor market involvement, there is little or no short and long run comparative study of this topic in advanced and less advanced countries, especially among less advanced economies which are still undergoing demographic transition. Besides, there is also little study on the relationship between male and female labor market involvement, not even that of comparative studies in developed and developing countries. Policies that seem to work for advanced countries may not necessarily work for less advanced countries.

1.5.0 The Structure of the Paper

The research is structured as follows: Currently existing literature is reviewed in chapter 2; chapter 3 contains econometric issues, methodology employed, and the data used. Chapter 4 presents empirical results, and further discussions of the main findings of the research. The last chapter which is 5 summarizes and concludes the research as well as presents some policy implications of the findings of the research.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1.0 General Overview of Fertility and Female Labor Market Involvement

A lot of literature has been reviewed regarding the effects of birthrate on women labor market involvement. As the pioneers of the economic study of FLFP, the works of Mincer (1962) and Cain (1966) gained considerable attention. In the very recent decades, the world female labor market involvement rate has stayed fairly constant, decreasing fairly little for the total female working-age population of fifteen years and above from 52.2% in the early 1990s to 51.4% in 2012 (International Labor Organization's estimates, http://www.ilo.org/kilm)[8]. According to Sher Verick "despite the fact that in the very recent two decades about three hundred and seventy point five (370.5) million women have involved in the work force, women's involvement in the labor market accounts for just about 40% of the world labor supply,[9] and a reduction in the breach of participation rates of men and women".[10] However, as school attendance rate increases, labor supply rates of women have dropped amid the school-attending group indicating an upward movement.[11]

The assessment of noble events of the relationship between birthrate and female involvement in the labor market seems to posit an inverse association between the two. Becker and Lewis (1973) as well as Willis (1973) were the first researchers to theoretically state the

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[8] Sher Verick, "Female labor force participation in developing countries." *IZA World of Labor* 87, (2014): 3, doi: 10.15185/izawol.87

[9] Ibid.

[10] Nadia Campaniello, "Women in Crime: Over the Last 50 Years Women have been Increasing their Participation in the Labor Market and Crime Market." *IZA World of Labor 105*, (2014): 9, doi: 10.15185/izawol.105

[11] Ibid.

presence of an adverse association between birthrate and female labor market involvement, but it was empirically documented by Butz and Ward (1979) for the U.S. and Mincer (1985) using a cross-country research[12]. However, very recent evidence seems to suggest a mixed relationship. According to Hui Wang "some of the studies that found a mixed result of birthrate on women involvement in the work force include: Bloom et al. (2009), Porter and King (2010) and Aguero and Marks (2011)."[13]

Based on theory, generally about four chances can occur in the causal association intermediating birthrate and female workforce dynamics. According to Hong Nguyen, these are:

> (a) Zero(0) causal effects of birth rate on women labor market involvement; (b) one way causality coming from fertility to female labor market involvement; (c) One way causality coming from women labor market involvement to birthrate; and (d) two directional causality mediating fertility and female labor market involvement. Several empirical research outcomes are either of the above possible outcomes.[14]

2.2.0 Fertility and Female Labor Market Involvement in Developed Countries:

There has been a rapid decrease in the birth rates coupled with a strong rise in female labor market involvement rates in many developed economies over the past years[15]. "The occurrence and pace of the rise has been different among countries, the United States and

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12 Daniela D. Boca, et'al., "Labour Market Participation of Women and Fertility: The Effect of Social Policies", http://www.frdb.org.

13 Quoted in Hui Wang, "Fertility and Female Labor Force Participation: Evidence from the One-Child Policy in China" *Journal of Economic Literature Classification: J13; J22; O15*. Michigan State University, (2014): 4.

14 Thoan Thi Hong Nguyen, *"*The Effects of Fertility on Female Labor Supply," (masters diss., Kansas State University, 2009): 2-3. http:// www.krex.k-state.edu

15 Florence Jaumotte, "Labour Force Participation of Women: Empirical Evidence on the Role of Policy and other Determinants in OECD Countries" *OECD Economic Studies, no. 37* (2003): 52. http://www.oecd.org/eco/growth/34562935

Nordics starting earlier. The massive rises have been seen in lower income countries in southern Europe comprising of Portugal, Spain, Italy and Greece and also including Ireland and some Northern European countries including Netherlands, Belgium, Luxembourg, and Germany[16]". According to Henriette Engelhardt e'tal. (2002), "several researchers who studied on OECD countries including the likes of Ahn and Mira (2002); Brewster and Rindfuss (2000); Esping Andersen (1999); Rindfuss et al. (2000) also found a change in the association between the birth rate (TFR) and the FLFP rate using cross country data."[17] Besides this Rindfuss and Brewster (1996) also found a change in the relationship between total birthrate and women labor market involvement rate.[18] The relationship changed from an adverse effect before the 1980s to a positive effect afterwards.[19] Those countries that presently exhibit the lowest levels of birthrate are the same countries that have considerably low levels of women labor market involvement rate, and the countries with much greater levels of birth rate seem to show somewhat high women labor market involvement rate[20]. Using cross-sectional data, Kogel (2002) posited that the diversion in the direction of the cross-country relationship between women labor market involvement and childbirth can be attributed to undetected country-unique features and diversity

16 Jaumotte, "Labour Force Participation of Women," (2003): 52.

17 Quoted in Henriette Engelhardt et al., "On the Changing Correlation between Fertility and Female Employment over Space and Time*," MPIDR Working Paper WP 2002-052* (Germany: Max Planck Institute for Demographic Research, 2002): 2.

18 Ibid., pg. 3.

19 Ibid., pg. 2.

20 Ibid.

in the length of the inverse time-series correlation.[21] Benjamin (2001) also found that the relationship between female labor market involvement rate and birthrate turns positive with the passing of time, in spite of the fact that the occurrence of this change relies on the country category (largely showing mutually exclusive activities). Also McNown and Michael (1985), using a two variable approach to determine the causal association between birthrate and women labor market involvement rate in America, revealed that the female labor market involvement is causally associated with birthrate and that the causal impact is positive. Using estimates of the influence of women occupation and country dummies by employing a fixed effects General Least Square (GLS) model taking care of autocorrelation and heteroscedasticity, Pampel (2001) finds an inverse impact of female labor market involvement rate on birthrate depending on social groupings such as class and gender equity of the particular country group. Moreover, he further adds that, in the beginning there is a rise in female labor market involvement rate which strongly lowers birthrate, but continued rising leads to a progressively less inverse influence on birthrates. Amongst the studies that found a change in sign between FLFP and childbirth includes that of Adsera (2004). However the study could not ascertain if labor market institutions shaped the changing correlation.

Despite the change in sign and sharp increase in female labor market involvement rate particularly that of women with young children, employed females continue to take the basic roles for their families. The hindrance family life puts on women who undertake market jobs have led to employment disruptions that put further detrimental influences on women's ability to

[21] Tomas Kogel, "Did the Association between Fertility and Female Employment Within OECD Countries Really Change its Sign?" *MPIDR Working Paper WP 2001/034, Rostock: Max Planck Institute for Demographic Research*. (2002.): 12-13.

grab good paying jobs and command good remunerations. Consequently, mothers accumulate fewer years of experience along their working lives than non-mothers (or men). They also accumulate fewer resources since they tend to work shorter hours, more often than not in part time jobs, and are more circumscribed in their ability to compete for highly paid jobs. From a human capital standpoint, the lower attachment of women to the labor market and their work interruptions lead to lower levels of investments in human capital, hence to lower productivity. Numerous studies demonstrate a wage penalty associated with having children (Waldfogel (1997), (1998); Budig & England (2001); Avellar & Smock (2003); Anderson, Binder & Krause (2002)). According to Becker (1981) the rise in women's opportunity cost affects both the attractiveness of marriage and the cost of children, resulting in lower rates of nuptial and birthrate. Oppenheimer (1997), on the contrary, argues that marriage is still attractive but delayed to later ages because men and women have long periods of involvement in education and career building (see Blossfeld & Huinink 1991 ref.). From a life-course perspective, the timing of family events is seen as crucial for understanding career paths and employment outcomes. The timing of entering parenthood has a lasting effect on women's life chances and their work behavior (Taniguchi 1999). Delaying of childbirth is a means of alleviating the adverse effects of work disruptions as a result of the event taking place after the vital point of establishing one's career. Women who give birth early in life spend less time preparing and establishing their careers, so they earn lower wages (Taniguchi 1999). Amuedo-Dorantes and Kimmel (2003) also found that women who delayed childbirth to their thirties had wages similar to those who had never given birth and 7% higher than women who had entered parenthood earlier in life.

In addition, vast literature exist on the adverse effects of fertility on working mothers, not only the effects of childbirth and childcare on work continuity, and attachment to the labor

market (Felmlee, (1995); Uunk, Kalmijn & Muffels (2005); Taniguchi & Rosenfeld (2002); Buchman et al. 2004; Stier & Yaish (2006)) but also how having children entails a wage penalty for their employed mothers (Avelar & Smock (2003); Budig & England (2001)). Accordingly, children may force mothers to quit their jobs or minimize their involvement in the labor market, or may take flexible part-time and less demanding jobs (Stier 1998).[22] In many instances mothers, even highly educated professionals with high wage potential, prefer jobs with lower demands on their time or with better opportunities for combining work and family duties. Using two Stage Least Square (2SLS) and Instrumental Variable approach to examine the effects of birthrate (considering offspring sex composition and twinning) on mother's labor force participation, Joshua and William (1998) find that the association of childbirth and women labor supply is inverse. They further state the effects of children on women labor force being minimal and probably absent for highly educated women. This result they posited "contradicts most theories of household time distribution which suggest greater impact of birthrate on women labor market involvement of highly educated females."[23] The works of Bloom et al., (2007); Angrist and Evans, (1998); and Heckman and Willis, 1977; found an inverse association of childbirth and women labor market involvement.[24] Hence efforts need to be made at reducing the effects of

[22] Haya Stier and Avital Sela-Dotan, "Timing of Childbirth and Employment Consequences: The Israeli Case" *Tel Aviv University.* (2007): 4. http://www.soc.cas.cz

[23] Joshua D. Angrist and William N. Evans, *Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size.* (*The* American Economic Review, Vol. 88, No. 3. Jun., 1998), pp. 450-477

[24] Quoted in Thoan Thi Hong Nguyen, *"*The Effects of Fertility on Female Labor Supply," (masters diss., Kansas State University, 2009), 8-9. http://www.Krex.k-state.edu.

child birth to free women to render their services for sale in the labor market outside their home.[25]

Both **c**hildbearing and female labor market involvement were very low in some parts of southern Europe and this is attributed to not only very rigid nature of work hours, but also due to difficulty for women to come back to the labor force after having a child, as well as occurring at a time when attitude towards good family existed.[26] An inverse association between FLFP and childbirth is worrisome for so many reasons, including the special importance of it in Europe where pension benefits of the current working group helps in financing the retirement benefits of retired workers. Both low birthrate and high female labor market involvement have opposing influences on the pension system where low birthrate jeopardizes, while high female labor market involvement enhances its prospects and survival.

Among the studies that argue of no causal association of childbirth and female labor market involvement includes that of Papapetrou (2004) and Cheng (1999). Contrary to this, Cheng (1996) and Cheng et'al (1997) established that there exists a relationship coming from childbirth to female labor force involvement.[27] Likewise Zimmermann (1985) earlier found a causal relationship coming from childbirth to female labor market involvement.

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[25] Ibid., pg. 9

[26] Dalla Zuanna and Micheli, "Strong family and low fertility: a paradox? New perspective in interpreting contemporary family and reproductive behavior". *Dordrecht: Kluwer Academic Publishers*: 7-21

[27] Benjamin S. Cheng, "Cointegration and Causality between Fertility and Female Labor Participation in Taiwan: A multivariate Approach," *Atlantic Economic Journal*, (1999): DOI:10.1007/BF02298338

2.3.0 Fertility and Female Labor Market Involvement in Developing Countries

Contrast to the increase in female labor force involvement in advanced countries, in many less advanced countries the female labor market involvement rates tends to decline slenderly despite the fact that it is a "strategy use to response to economic shocks that hit the household[28]". As a result of these shocks women strive hard to get involved in labor market amidst hindrances. Female labor market involvement changes considerably over time across developing countries and prominent and rising economies. Labor market involvement of women in the Arab world especially in North Africa and Middle East has shown an increasing trend over the period of 1992 to 2012 despite social and religious barriers. Similar to this, is the rising trend in the Caribbean and Latin Americas, and contrary is the case in South Asia where female labor market involvement shows a decreasing trend.[29]

Engracia and Herrin (1984) pointed out that in the South Asian nation of Philippines, the influence of female employment on birthrate changes with time as presently working females turn to have more children but in the long run females with work experience have fewer children.[30] Using two capital cities in West Africa, Dakar and Lomé to be precise, Beguy (2009) studied the influence of female employment on birthrate and found that in Dakar neither women

[28] Sher Verick, "Female labor force participation in developing countries". *IZA World of Labor* 87, (2014): 1, doi: 10.15185/izawol.87

[29] Sher Verick, "Female labor force participation in developing countries". *IZA World of Labor* 87, (2014): 4-5, doi: 10.15185/izawol.87

[30] Donatien Beguy, "The Impact of Female Employment on Fertility in Dakar (Senegal) and Lomé(Togo)*". Germany, Max Planck Institute for Demographic Research* Konrad-Zuse Str. 1, D-18057 Rostock (2009): 105. (http://www.demographic-research.org/volumes/vol20/7/20-7), DOI: 10.4054/DemRes.2009.20.7

jobs nor human capital have a major impact on the chances of giving birth.[31] Contrary, education and employment hinders fertility significantly in Lomé, Togo. He further points out that "women are inadequately represented and are therefore the minority in the public sector of the economy but rather dominates in the informal sector characterized as insecure and low-paid jobs within Sub Saharan Africa."[32] In addition to this, Van Den and Maertens (2014) also find an inverse association of FLFP and childbirth in Senegal.[33]

Studies conducted by Brilleau, Roubaud, and Torelli (2004), and Collier et al (1994) find that fertility has little or no impact on FLFP in Nigeria and that a woman can possibly become a mother and a worker or student at the same time in Nigeria.[34] "Another study conducted by Younger (2006) suggests that some female employment can go along with child rearing; therefore, female employment may have little or no effect on child bearing decisions."[35] "He further proposes that the communal living of Africans encourages a woman to have as many children as possible while working or schooling since there can always be a family member or friend to help nurse the child."[36]

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31 Ibid. pg. 119.

32 Donatien Beguy, "The impact of Female Employment on Fertility in Dakar (Senegal) and Lomé (Togo)." *Germany, Max Planck Institute for Demographic Research* Konrad-Zuse Str. 1, D-18057 Rostock (2009): 101. (http://www.demographic-research.org/volumes/vol20/7/20-7), DOI: 10.4054/DemRes.2009.20.7

33 Goedele Van den Broeck and Miet Maertens, "Female Employment reduces Fertility in Rural Senegal" *PLoS ONE 10(3).* (2015): 11. Doi: 10.1371/ journal.pone.0122086.

34 Quoted in Oyeyemi O.Adebiyi and Temitayo A. Onifade, "Testing the Relationship between Female Labor Force Participation and Fertility in Nigeria" *Mediterrean Journal of Social Sciences.* Rome, Italy. *(2014): 1323-1326.* DOI: 10.5901/mjss.2014.v5n27p1322.

35 Ibid.

36 Ibid.

Studies of Budig (2003) and Lloyd (1991) find that in advanced economies there is a persistent inverse association between childbirth and female paid employment at a large scale whereas the works of Lloyd (1991); Pichéé, Poirier, and Neill (1989) indicate that, there seems to be no definite relationship between female wages and childbirth in developing countries.[37] In sub-Saharan Africa to be precise, it is proposed that there should not exist a relationship between labor market involvement and fertility because of inadequate paid employment opportunities, strong large family interactions, and less expensive local labor. Gender discrimination in terms of duties in household is another reason responsible for no relationship between childbirth and female employment. According to Beguy (2009) "based on Oppong (1988, 1991), it is likely that these mediating factors vary across different settings in sub-Saharan Africa, thereby resulting in the discrepancy in the female employment–fertility relationship in this region.**"**[38]

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[37] Donatien Beguy, "The Impact of Female Employment on Fertility in Dakar (Senegal) and Lomé (Togo)*."* (2009)

[38] Quoted in Donatien Beguy, "The Impact of Female Employment on Fertility in Dakar (Senegal) and Lomé (Togo)*." Germany, Max Planck Institute for Demographic Research* Konrad-Zuse Str. 1, D-18057 Rostock (2009): 101. (http://www.demographic-research.org/volumes/vol20/7/20-7), DOI: 10.4054/DemRes.2009.20.7

CHAPTER THREE

3.0 METHODOLOGY

3.1.0 Econometric Set up and Computation

To be able to empirically prove the substantial influence of fertility and MLFP on FLFP, we select the explained variables, independent variables and econometric set up to examine the real impact of fertility and male labor supply on female labor market involvement. The study is done on a country basis. We employ a log-log function to examine the impact on a percentage basis (which means the coefficients can be interpreted as elasticities)

3.2.0 Model Specification

Model 1: For both developed and developing countries.

$$Loglfpr_{fm} = \beta_1 + \beta_2 loggdpcap_i + \beta_3 logfert_i + \beta_4 loglfpr_{mli} + \beta_5 logpri_i + \beta_6 logsec_i + \beta_7 logtert_i + \beta_8 loginv_i + \beta_9 loginfl_{i+} u_i$$

Where $i = 1,2,...,n$ is a country index. $lfpr_{fm}$ is female labor force participation rate, *gdpcap* is the real GDP per capita, *fert* is fertility rate. $lfpr_{ml}$ is male labor market involvement rate. *pri* is the female primary school enrolment, *sec* is the female secondary school enrolment, *tert* is the female tertiary school enrolment. *Inv* is a measure of private investment, and *infl* is *inflation* an indicator of the inflation rate. u_i is the disturbance term. We expect that $\beta_2 < 0$: which implies that, the richer the people, the lower the female market involvement rate; $\beta_3 < 0$: the larger the fertility rate, the lower the female labor market involvement rate; $\beta_4 < 0$: the higher the male labor market participation the lower the females will get involved in the market due to competition for scarce jobs, β_5 , β_6 and β_7 are expected to be less than zero (0) in the short

run but greater than zero (0) in the long run because of the income effect. When $\beta_8 > 0$, means that the larger investment expenditure leads to the creation of new jobs, and $\beta_9 > 0$: higher inflation means higher living cost and this will raise labor market involvement rate.

Model 2: For sub group of developing countries; SSA countries and Other Developing Countries.

$$Loglfpr_{fm} = \beta_1 + \beta_2 loggdpcap_i + \beta_3 logfert_i + \beta_4 loglfpr_{mli} + \beta_5 logfet*logpri_i + \beta 6 logfet*logseci + \beta_7 logfet*logtert_i + \beta_8 loginv_i + u_i$$

Where $i = 1,2,...,n$ is a country index. $lfpr_{fm}$ is female labor force participation rate, *gdpcap* is the real GDP per capita, *fert* is fertility rate. $lfpr_{ml}$ is male labor market involvement rate. *fet*pri* is the interaction term between fertility and female primary school enrolment, *fet*sec* is the interaction term between fertility and female secondary school enrolment, *fet*tert* is the interaction term between fertility and female tertiary school enrolment. *Inv* is a measure of private investment, and u_i is the disturbance term.

3.3.0 Estimation Strategy:

We used both cross sectional and panel regression to predict the immediate and long run effects of fertility and male labor supply rate on women labor market participation based on developed or developing countries category. The developing country category is further segregated into SSA and ODCs to estimate for regional differences. The period of analysis is from 1974-2013.

(a) Cross Sectional Regression:

Using model 1 and model 2 above, we employ pooled OLS with robust standard errors and 2SLS IV regression for robustness check.

(b) Panel Regression:

To check whether fertility and male labor market involvement would actually affect female labor market involvement we employ these methods: OLS, Random Effect and Fixed Effect which takes care of unseen characteristics and specific effects of fertility. To prove the first hypothesis, we run a regression of the following pooled OLS equation.

$$Loglfpr_{fm} = \beta_1 + \beta_2 loggdpcap_i + \beta_3 logfert_i + \beta_4 loglfpr_{mli} + \beta_5 logpri_i + \beta_6 sec_i + \beta_7 logtert_i + \beta_8 loginv_i + \beta_9 loginfl_{i+} \alpha_{i+} u_i$$

Where, α_i is the unobserved specific fixed effect of fertility rate, male labor supply and other independent variables.

According to Stock & Watson, 2007, as quoted by Leila (2014) "there can exist several econometrical issues using a strategy like this which needs more attention."[39] All the explanatory and control variables in our model should affect female labor force participation. There is the possibility that some variables may have a relationship with and could affect the independent variables (FLFP and Male labor supply) but may be omitted, making the OLS untrue estimators. We therefore calculate the true effects of fertility and male labor supply using RE and FE models.[40]

Based on Lensink and Mersland,(2009); Hartarska, (2007) FE takes cognizance of the fact that the disturbance term is not related with the predictor variables because it take care of all unseen heterogeneous effects that could correct for omitted variables, as well as uninterrupted time property and gives true estimates.[41] The FE model is better that the Ordinary Least Square

[39] Quoted in Leila Ume, "Essays On The Impact Of Microfinance On Poverty Alleviation", (Phd diss., KDI school, 2014)

[40] Ibid

[41] Ibid.

because it caters for omitted variable bias and helps in the correction of endogeneity problem as well as eliminates uninterrupted time problems, thus making it possible to measure the real effects of predictors on the predicted one. This gives true and consistent estimated coefficients.[42] In order to find out whether random effect or fixed effect is better for our data set we carry out a Hausman specification test under the null and alternate hypothesis as follows:

H_0= Cov ($,i\,'$)=0 (Random Effect)
H_1= Cov ($,xii\,'$)≠0 (Fixed Effect)

Random and Fixed effect estimators are dependable and undeviating under null however RE estimator is inconsistent under the alternate hypothesis. RE estimator is efficient under the null hypothesis. In the null hypothesis the Standard error ($\hat{\beta}_{RE}$) is less than the standard error of ($\hat{\beta}_{FE}$)

$$\boldsymbol{H} = \frac{(\hat{\beta}_{FE} - (\hat{\beta}_{RE})^2}{Var\,(\hat{\beta}_{FE}) - Var\,(\hat{\beta}_{RE})} \sim \chi 2 \text{ with 1degree of freedom, that is with no intercept}$$

3.4.0 Robustness Check

In order to correct for reverse causality and omitted variables bias (endogeneity problem) we use instrumental variable regression where initial values of the independent variables and other controls are used as instruments. We further check for relevance of the instruments used.

3.4.1. Formal Test if Fertility Significantly Differs between Sub Groups

To test whether the effects of fertility and male labor market involvement rate on female labor market involvement differ between developed and developing, and within developing countries, we use the two (2) group mean comparison test and also regression

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[42] Ibid.

of developed dummy on fertility and male labor market involvement rate. We further run a regression of SSA dummy (r6) on both fertility and MLFP rate to cater for regional differences.

3.5.0 Data Set and Description

To explore whether the main variables (fertility and male supply of labor) will have an affirmative, favorable or adverse influence on the explained variable (FLFP); we utilize both longitudinal and cross-sectional data. The dataset consists of 196 developed and developing countries and a different set of 130 developing countries both of which are extracted from the WDI (2014). The main independent variables (fertility and male labor market involvement rate), fertility rate which is denoted as *fert is* calculated as total births per woman. Male labor market involvement denoted as $lfpr_{ml}$ is calculated as percentage of male population ages 15-64 (economically active group involved in the labor market) using ILO estimates. The explained variable (FLFP) is quoted as percentage of female population ages 15-64 (economically active group involved in the labor market) using ILO estimates. For cross section we averaged the data for all the variables over the period 1974-2013. The panel data is a five year averaged balanced data between 1974 and 2013. Control variables are also included to mitigate the effect of omitted variables bias. These are the log values of GDP per capita to cater for the potential income effects of economic growth on the female labor market involvement. Also included is female school enrolment rates (primary, secondary and tertiary enrolment rates) measured as gross enrolment regardless of age. Private investment is measured by gross capital formation as a percentage of GDP (investment) to account for the potential growth effect of physical capital, inflation proxied by the percentage changes in the CPI to capture the growth effect of inflation.

Since the main purpose of the study is to find out the effects of fertility and male labor market involvement rate on FLFP between developed and developing economies, and also among developing countries, we therefore segregate the data into two subsamples: developed and developing. The developing countries category is further segregated into Sub Saharan Africa and other developing countries to estimate regional differences. Table 1 below shows the summary of data and their sources including abbreviations used.

Table 1: Summary of Data and Their Sources.

Variables	Abbreviation	Description	Sources
Female labor force participation rate	lfpr_fm	Dependent variable	World Development Indicators (WDI)
Fertility rate	fert	Independent variable	(WDI)
Male labor force participation rate	lfpr_ml	Independent variable	(WDI)
GDP per Capita (2005 constant US$	Gdppcap	Control variable	(WDI)
Female primary school enrolment rate	pri.	Control variable	(WDI)
Female secondary school enrolment rate	sec.	Control variable	(WDI)
Female tertiary school enrolment rate	tert.	Control variable	(WDI)
Gross capital formation (investment)	inv.	Control variable	(WDI)
CPI (inflation)	infl.	Control variable	(WDI)

Figure 1, 2 and 3 show a histogram of normal distribution of the FLFP, fertility and MLFP respectively.

Figure 1: Normal Distribution of Female Labor Force Participation Rate Sample Data

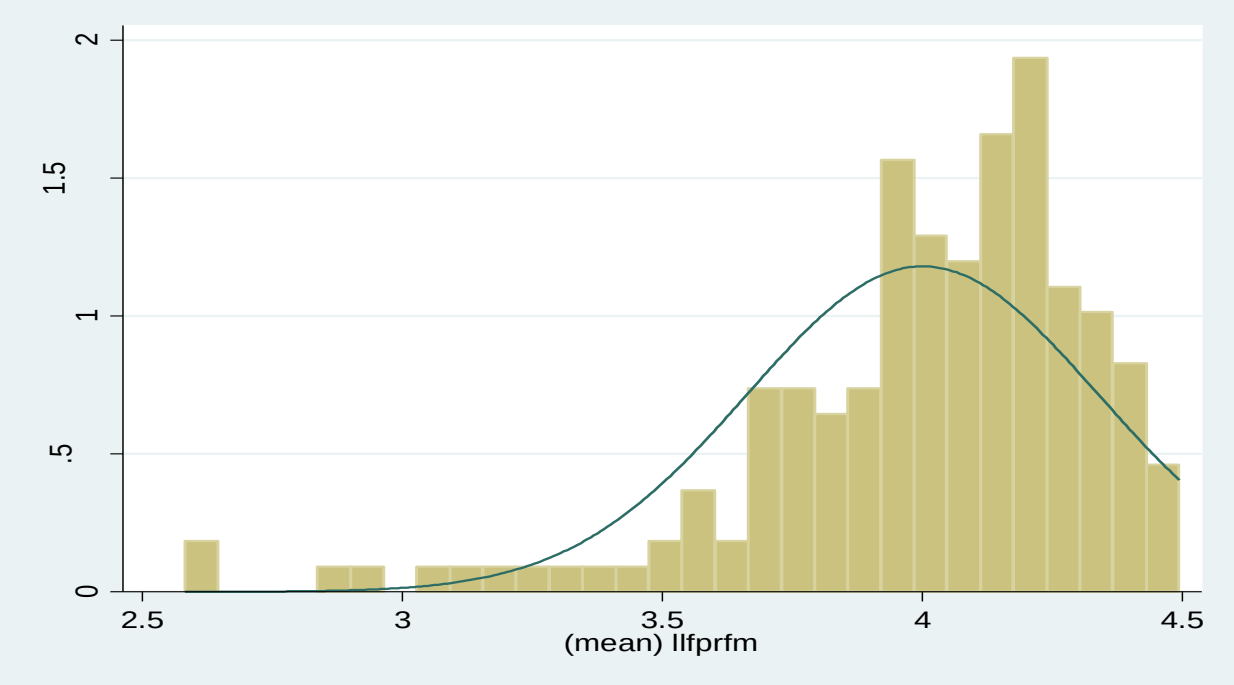

Figure 2: Normal Distribution of Fertility Rate Sample Data

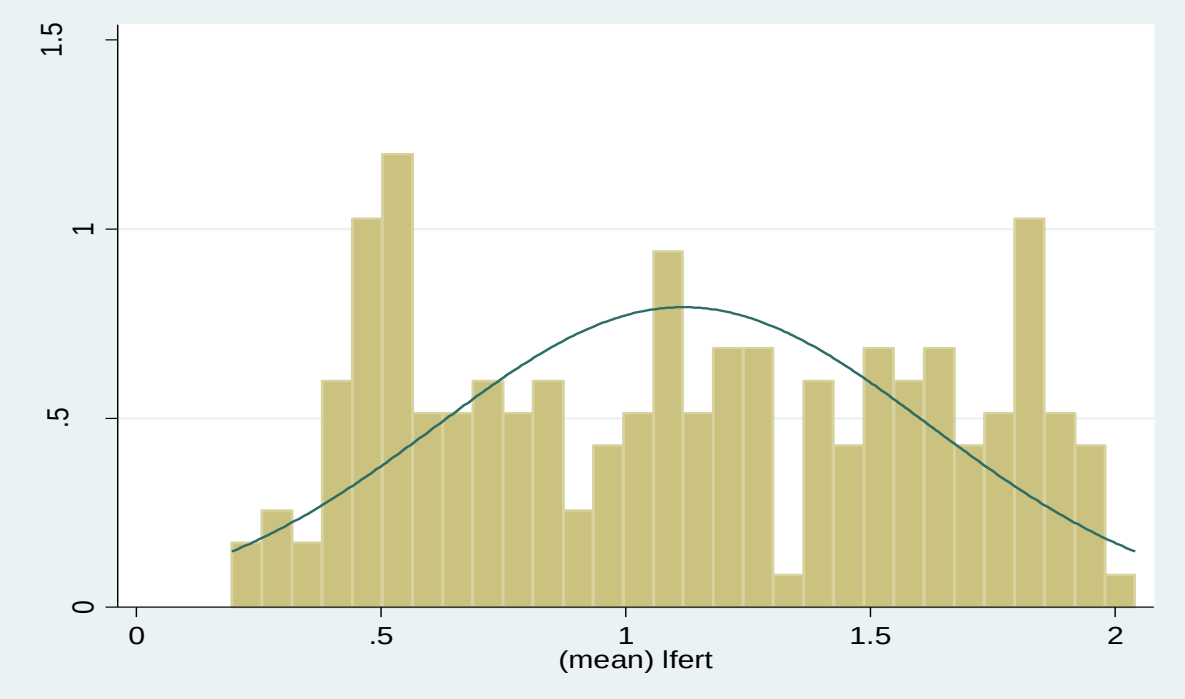

Figure 3: Normal Distribution of Male Labor Market Involvement Rate Sample Data

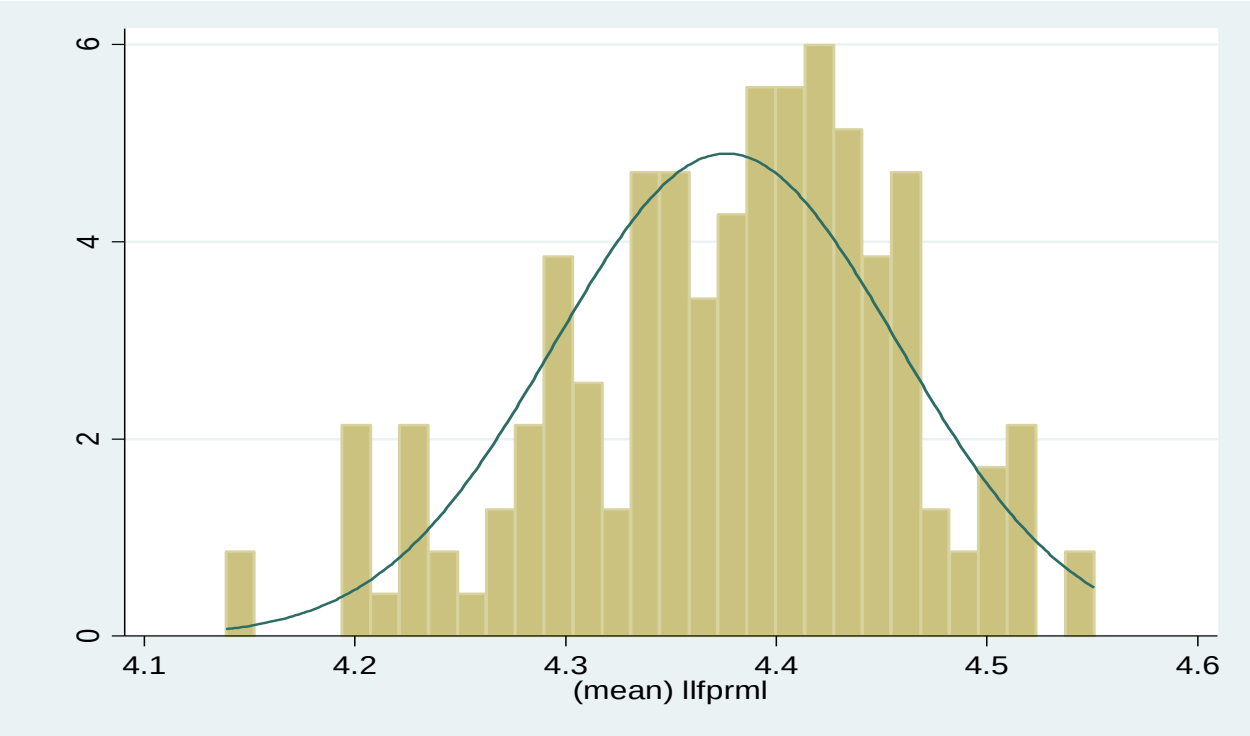

Table 2: Descriptive Statistics and Correlation Matrix of Variables.

Panel A: Summary Statistics with Logarithmic Variables									
	lfpr_fm	*Gdpcap*	*fert*	*lfpr_ml*	*pri*	*sec*	*tert*	*inv*	*infl*
Mean	4.0010	8.0535	1.1173	4.3763	4.5145	3.8868	2.1583	3.0575	1.8359
Median	4.0695	7.9691	1.1125	4.3871	4.6069	4.3220	2.6154	3.0687	1.7243
Standard dev.	0.3379	1.6077	0.5027	0.8150	0.2967	0.8599	1.6630	0.3042	0.7713
Standard error	0.0259	0.1179	0.0365	0.0063	0.0221	0.0643	0.1254	4.4608	4.4792
Maximum	4.4949	11.5895	2.0399	4.5509	4.9666	4.9429	4.5908	2.0475	0.3286
Minimum	2.5813	5.0641	0.1953	4.1387	3.1825	1.1251	-2.6283	0.0231	0.0593

Panel B below shows the correlation matrix with logarithmic variables. It shows an existence of an inverse interrelationship between female labor market involvement and birthrate while there exist a positive interrelationship between FLFP and MLFP rate.

Panel B: Correlation Matrix with Logarithmic Variables

	lfpr_fm	*Gdpcap*	*fert*	*lfpr_ml*	*pri*	*sec*	*tert*	*inv*	*Infl*
lfpr_fm	1.0000								
Gdpcap	-0.0244	1.0000							
Fert	-0.0756	-0.8046*	1.0000						
lfpr_ml	0.2162*	-0.0770	0.1557*	1.0000					
Pri	-0.0089	0.4963*	-0.4870*	-0.0856	1.0000				
Sec	-0.1274	0.7287*	-0.7801*	-0.2216*	0.7526*	1.0000			
Tert	-0.1253	0.7066*	-0.7953*	-0.1987*	0.6176*	0.8834*	1.0000		
Inv	-0.0886	0.2825*	-0.3095*	0.0535	0.3496*	0.3636*	0.2473*	1.0000	
Infl	0.0747	-0.4033*	0.2701*	-0.1443	-0.0241	-0.1966*	-0.1270	-0.2656*	1.000

Note: * indicates significant at the 5% level.

CHAPTER FOUR

3.0 EMPIRICAL RESULTS

The results of the estimated regressions are recorded in table 3, table 4, table 5, and table 6. The first five columns display the estimates using the whole sample countries with column (1) considering GDP per capita (*lgdpca)* and fertility (*lfert).* Column (2) adding male labor force participation rate (*llfprml)* into the regression, column (3) including female primary school enrolment rate (*lpri),* female secondary school enrolment rate *(lsec),* female tertiary school enrolment rate *(ltert).* In column (4) we added investment (*linv)* and column (5) includes inflation (*linfl).* The remaining columns (6) and (7) of the tables show the estimation results for developed and developing countries, SSA and ODCs respectively, with the full set of control variables.

4.1.0 Long Run Relationship: Cross Sectional Results

In column 1 of table 3, the result shows that GDP per capita inversely effects female labor market involvement and significant at 5% level, implying that an increase in income will reduce female labor market involvement by 0.049 at 5% significance level. It also shows that fertility rate is inversely related with FLFP at 5% level of significant, indicating a 1% rise in fertility rate will lead to a 0.17% fall in FLFP.

The result in column 2 shows that the effect of GDP per capita on FLFP remains adverse with a coefficient of 0.056, implying that a 1% increment in income will reduce female labor market involvement by 0.056 at 5% significance level. The coefficient estimate of fertility rate remains inverse and the significant level increases to 1%, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.211% at 1% significant level. It also reveals that MLFP is

positive and significant at 1% significance level. This implies that a 1% rise in MLFP will lead to a 1.01% rise in FLFP.

In column 3 the result shows the adverse effects of the coefficient estimate of GDP per capita which is not significant at 10% level. It further reveals that fertility rate is inversely connected with FLFP at 1% significant level, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.476%. The results also show that the effect of MLFP on FLFP is positive and significant at 5% significance level, implying that a 1% rise in MLFP will increase FLFP by 0.658% at 5% significant level. The coefficient estimate of primary enrolment is positive and significant at 5%, while that of secondary enrolment is inverse and significant at 1%. The effect of tertiary enrolment is inverse with a minor effect.

The result in column 4 shows the adverse effect of GDP per capita with a coefficient estimate of -0.024, which has a minor effect. It also reveals the adverse effect of fertility rate on FLFP with a value of -0.486 at 1% level of significance, indicating that 1% rise in fertility rate will lead to a 0.486% fall in FLFP. The effect of MLFP is positive and significant at 5%, with a coefficient estimate of 0.735, implying a 1% rise in MLFP leads to a 0.735% rise in FLFP. It further shows that primary enrolment has a 0.363% major effect at 5%, while secondary enrolment has a -0.18% major effect on FLFP at 5% level of significance. The coefficient estimate for tertiary enrolment and investment are inversely related with FLFP with minor effect.

The result in column 5 shows the adverse effects of fertility rate with a value of -0.498 which is significant at 1% significant level, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.498%. It also indicates that MLFP has an affirmative and a major effect at 5% significance level. This implies that a 1% rise in MLFP will facilitate an increase in FLFP by 0.781%. The results further show that primary enrolment with an estimated value of 0.339 has a

major positive impact at 5% level, while that of secondary enrolment has an adverse effect at 5%. Tertiary enrolment, GDP per capita and investment are all negative and not significant even at 10%, inflation is affirmative and has a minor effect. In all the five regressions the coefficient of the main variables show the same effects; fertility rate increases and the level of significant still at 1% level, and male labor supply remains positive after adding more control variables. This shows a very consistent result.

Subsamples

1. ***Developed Countries***:

In column 6 of table 3 labeled developed, the result shows the insignificant positive effect of increase in income per capita and fertility rate on FLFP. It also indicates that MLFP has an affirmative but insignificant effect. The results further show that primary enrolment and secondary are not significant while a 1% increment in tertiary enrolment will lead to a 0.115% rise in FLFP at 5% significant level. Investment also has favorably affect on FLFP at 1% significance level.

2. *Developing Countries:*

In column 7 of table 3 labeled developing, the result shows the adverse effects of the coefficient estimate of GDP capita which is significant at 1% level and this indicates that a 1% rise in GDP per capita will lead to a fall in female labor market involvement by 0.137% at 1% significance level. Fertility has an inverse relationship with female labor supply, with an estimated value of -0.628 being significant at 1%, indicating that in developing countries, a 1% rise in fertility rate will make female work involvement rate to fall by 0.628%, at 1% significance level. It also shows that MLFP positively affect FLFP with a weak significant level of 10%. Primary enrolment also shows a favorable effect at a significance level of 1%, indicating that a 1% rise in

primary enrolment of females will raise FLFP in developing countries by 0.457, while that of secondary enrolment is inverse but not significant at 10%. The estimates for tertiary school enrolment alongside investment show adverse effects and are significant at 5%, whereas that of inflation is positive and significant at 10%.

Regarding control variables, primary school enrolment has a 1% level of significance favorable impact on FLFP in less developed countries, but has an insignificant impact in developed countries. Tertiary enrolment has a positive effect at 5% significance level in developed economies but has a negative and 5% significant effect on FLFP in developing countries. Referring to developed countries, investment favorably affects FLFP at 1% significance level but has a significantly negative impact for developing countries. A rise in inflation will leads to a rise in FLFP at 10% level of significance in developing countries but no significant impact in developed countries.

Table 3: Cross Sectional Regression Results (Long Run Relationship)

	(1)	(2)	(3)	(4)	(5)	Developed	Developing
lgdpcap	-0.049**	-0.056**	-0.024	-0.024	-0.013	0.045	-0.137***
	(0.022)	(0.022)	(0.021)	(0.023)	(0.026)	(0.034)	(0.042)
lfert	-0.170**	-0.211***	-0.476***	-0.486***	-0.498***	0.026	-0.628***
	(0.067)	(0.073)	(0.106)	(0.116)	(0.117)	(0.113)	(0.138)
llfprm		1.010***	0.658**	0.735**	0.781**	0.635	0.663*
		(0.307)	(0.286)	(0.302)	(0.322)	(0.504)	(0.355)
lpri			0.339**	0.363**	0.339**	0.162	0.457***
			(0.133)	(0.141)	(0.145)	(0.382)	(0.145)
lsec			-0.218***	-0.180**	-0.181**	-0.011	-0.103
			(0.079)	(0.087)	(0.092)	(0.141)	(0.103)
ltert			-0.056	-0.072	-0.074	0.115**	-0.132**
			(0.044)	(0.048)	(0.051)	(0.045)	(0.055)
linv				-0.175	-0.172	0.413***	-0.246**
				(0.109)	(0.110)	(0.136)	(0.114)
linfl					0.046	0.056	0.066*
					(0.033)	(0.041)	(0.036)
_cons	4.583***	0.259	1.292	1.285	1.032	-1.579	2.044
	(0.228)	(1.258)	(1.126)	(1.172)	(1.290)	(2.802)	(1.296)
R^2	0.02	0.08	0.19	0.20	0.21	0.48	0.35
N	166	166	162	160	156	49	107

Notes: The robust standard errors are shown in brackets. ***, ** and * indicate significance at 1%, 5% and 10%, accordingly.

4.1.1: Chow-Type Test to Show if the Effect of the Dependent Variables on FLFP Differs between Advanced and Less Advanced Countries:

Unrestricted Regression Model (UR):

$$\log lfprfm_i = \beta_1 + \beta_2 loggdpcap_i + \beta_3 logfert_i + \beta_4 loglfprml_i + \beta_5 logpri_i + \beta_6 logsec_i + \beta_7 logtert_i + \beta_8 loginv_i + \beta_9 loginfl_i + \beta_{10} developed + \beta_{11} loggdpcap_i \times developed + \beta_{12} logfert_i \times developed + \beta_{13} loglfprml_i \times developed + \beta_{14} logpri_i \times developed + \beta_{15} loglsec_i \times developed + \beta_{16} logtert_i \times developed + \beta_{17} \log inv_i \times developed + \beta_{18} \log inflation_i \times developed + u_i \sim (2)$$

$$H_0 := \beta_{12} = 0$$
$$H_1 := \beta_{12} \neq 0$$

$$H_0 : \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} = 0$$
$$H_2 : \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15} = \beta_{16} = \beta_{17} = \beta_{18} \neq 0$$

Under the nulls,

The Restricted Model (RM):

$$\log lfprfm_i = \beta_1 + \beta_2 loggdpcap_i + \beta_3 logfert_i + \beta_4 loglfprml_i + \beta_5 logpri_i + \beta_6 logsec_i + \beta_7 logtert_i + \beta_8 loginv_i + \beta_9 loginfl_i + u_i \sim (3)$$

$$F = \frac{(RSS_R - RSS_{UR}) / (df_R - df_{UR})}{RSS_{UR} / df_{UR}} \sim F_{df_R - df_{UR}, df_{UR}}$$

$$F = \frac{(RSS_R - RSS_{UR}) / [(n-9) - (n-18)]}{RSS_{UR} / (n-18)}$$

$$= \frac{(RSS_R - RSS_{UR}) / 9}{RSS_{UR} / (n-18)} \sim F_{9, n-18}$$

$$= \frac{(RSS_R - RSS_{UR}) / 9}{RSS_{UR} / 138} \sim F_{9,138}$$

$$= (4.38)$$

In row 2 of table 4 below, the results show that fertility has an inverse impact on FLFP and is significant at 1%. In column 6, the coefficient for developed is negative but not significant at 10%, which is different from that of developing countries with negative and highly significant at 1%.

Table 4: Chow-type Test Results Showing the Impact of Dependent Variables on FLFP in Advanced and Less Advanced Countries

	(1)	(2)	(3)	(4)	(5)
lgdpcap	-0.013	-0.141***	-0.138***	-0.137***	-0.137***
	(0.026)	(0.043)	(0.042)	(0.042)	(0.042)
lfert	-0.498***	-0.556***	-0.615***	-0.628***	-0.628***
	(0.117)	(0.137)	(0.142)	(0.140)	(0.141)
llfprml	0.781**	0.633*	0.635*	0.662*	0.663*
	(0.322)	(0.348)	(0.352)	(0.359)	(0.361)
lpri	0.339**	0.438***	0.448***	0.458***	0.457***
	(0.145)	(0.139)	(0.140)	(0.146)	(0.147)
lsec	-0.181**	-0.193**	-0.118	-0.103	-0.103
	(0.092)	(0.088)	(0.102)	(0.104)	(0.104)
ltert	-0.074	-0.062	-0.127**	-0.132**	-0.132**
	(0.051)	(0.046)	(0.055)	(0.056)	(0.056)
linv	-0.172	-0.132	-0.139	-0.246**	-0.246**
	(0.110)	(0.097)	(0.100)	(0.115)	(0.116)
linfl	0.046	0.075**	0.068**	0.064**	0.066*
	(0.033)	(0.032)	(0.032)	(0.031)	(0.037)
developed		-2.442	-3.719	-3.824	-3.623
		(2.517)	(2.896)	(2.917)	(2.997)
lgdpcap_dvpd		0.214***	0.176***	0.185***	0.182***
		(0.063)	(0.054)	(0.052)	(0.054)
lfert_dvpd		0.252	0.570***	0.653***	0.653***
		(0.154)	(0.191)	(0.177)	(0.177)
llfprml_dvpd		0.135	0.479	-0.005	-0.028
		(0.596)	(0.576)	(0.594)	(0.604)
lpri_dvpd			-0.014	-0.288	-0.295
			(0.427)	(0.403)	(0.395)
lsec_dvpd			-0.195	0.097	0.092
			(0.240)	(0.166)	(0.171)
ltert_dvpd			0.257***	0.244***	0.247***
			(0.072)	(0.069)	(0.071)
linv_dvpd				0.661***	0.658***
				(0.170)	(0.174)
linfl_dvpd					-0.010
					(0.054)
_cons	1.032	2.035	1.920	2.054	2.044
	(1.290)	(1.257)	(1.300)	(1.309)	(1.319)
R^2	0.21	0.31	0.36	0.38	0.38
N	156	156	156	156	156

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Since probability-value of 0.0013 is smaller than 5%, we reject both null hypothesis that fertility does not have different impacts between developed and developing countries.

Also since the p-value = 0.0000 which is much smaller than 5% we reject the null hypothesis that GDP per capita, male labor force participation, primary, secondary and tertiary enrolment, investment and inflation have no impacts on FLFP rate jointly. It means that these variables should be included in the regression model.

4.2.0 Long Run Relationship: Cross Sectional IV Regression Results

While fertility and male labor force can affect FLFP rate, FLFP might also have some effects on fertility and male labor force. To control this endogeneity bias, we instrument our fertility and male labor force variables with their values in the first year of the sample period. The instrumental variable (IV) regression estimation output is shown in table 5.

In column 1 of table 5, the result shows the adverse effects of the coefficient estimate of GDP capita which is -0.103 is significant at 1% level, implying that an increase in GDP per capita will reduce FLFP by 0.1031% at 1% significant level. The coefficient estimate of fertility rate (-0.404) is inverse and significant at 1% s level, indicating that a 1% rise in fertility rate will lead to a fall in FLFP by 0.404%.

In column 2 of table 5, the result shows that the adverse effect of increase in income per capita, being significant at 1% level, indicating that a % increment in income per capita reduces FLFP by 0.104%. The estimate value (-0.441) of fertility rate is inverse and significant at 1% significance level, indicating that a 1% upward shift in fertility reduces FLFP by 0.441%. The results also show that, the coefficient estimate of MLFP is positively related with FLFP at 1% significant level, indicating that a 1% rise in MLFP will lead to a 1.161% rise in FLMP.

Column 3 shows that the adverse effects of GDP per capita is inverse and insignificant at 10% level. The coefficient estimate ($\beta_3 = -0.723$) of fertility rate is negative and significant at 1% significant level, indicating that a 1% rise in fertility rate will lead to a 0.723% fall in FLFP.

The coefficient estimate ($\beta_4 = 0.603$) of MLFP shows a favorable effect at 5% significance level, which indicates that a 1% rise in MLFP will increase FLFP by 0.603%.

The estimate of primary enrolment ($\beta_5 = 0.425$) also shows a favorable impact at 1% significance level, while that of both secondary and tertiary enrolments are adverse, with 1 and 10% significance levels respectively.

The result in column 4 shows that adverse effect of GDP per capita which is not significant at 10% level. The coefficient estimate ($\beta_3 = -0.760$) of fertility rate is negative and significant at 1% significance level, indicating that a 1% growth in fertility rate will reduce FLFP by 0.760%. It further shows that the coefficient estimate ($\beta_4 = 0.691$) of MLFP has a favorable impact on FLFP with a significant level of 5%, indicating that a 1% rise in MLFP rate will raise FLFP by 0.691%. Primary enrolment is positively related with FLFP at a significant level of 1% while that of secondary enrolment is negative and significant at 1%. The estimates of both tertiary enrolment and investment are negative and significant at 10%.

The result in column 5 shows that the coefficient estimate, ($\beta_2 = -0.026$) of GDP per capita is inversely related with FLFP and not significant at 10% level. The coefficient estimate ($\beta_3 = -0.772$) of fertility rate shows that fertility is inversely associated with FLFP at 1% significance level, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.772%. The results further show that the coefficient estimate ($\beta_4 = 0.756$) of male labor force participation has a major favorable effect on FLFP at 5% level of significance, and that a 1% rise in MLFP will increase FLFP by 0.756 at 5% significance level. Also, the estimated value for primary enrolment (0.427) is positive and significant at 1%, while that of secondary enrolment shows an opposite effect at 1% significance level. The calculate values for tertiary enrolment (-

0.107) and that of investment (-0.201) are inversely related with FLFP at 10% significant level, while that of inflation (0.055) is positive and insignificant at 10%. In all the five regressions the sign of the computed values of the main variables, remains constant and still significant showing very consistent results.

Subsamples Results:

1. ***Developed Countries***:

In column 6 of table 5 labeled developed, the result shows that a 1% rise in GDP per capita will lead to 0.036% increase in FLFP with the effect being insignificant. It further shows that a 1% rise in fertility will minimally reduce FLFP by 0.051% in advanced countries since it is insignificant at 10%. The coefficient estimate of MLFP (0.8558) is positive and not significant at 10% significant level, indicating that MLFP has a minimal effect on FLFP in advanced countries. The results reveals further that primary enrolment and secondary have less significant adverse effect on FLFP at 10%. The result also indicates that tertiary enrolment with estimated value of (0.112) and investment with an estimated of value of (0.410) favorably influence FLFP at 5 and 1% level of significance respectively. The effect of inflation is positive and not significant at 10%. Some studies claim that the negative impact of fertility on FLFP in some OECD countries changes from negative to positive and this change is said to be associated with the formulation of family favorable policies together with the increase in childcare institution, and availability of women part time jobs.[43] Because of the insignificance of the inverse sign, this research infers that the negative sign is losing its strength and may gradually turn positive as posited by other researchers.

[43] Quoted in Irina Samsonova, "The Effects of Fertility and Abortions on female Employment Rate", (masters diss., Central European University, 2011): 3. http://www.ceu.edu/hu/kee.

2. Developing Countries:

In column (7) of table 5 labeled developing, the result shows that a 1% rise in GDP per capita will lead to 0.139% increase in FLFP at 1% level of significance. It further shows that a 1% rise in fertility will reduce FLFP by 0.804% at 1% significant level. It also indicates that male labor force participation has a positive but minimal effect on FLFP in less advanced countries. This is in contrast to the research by Maarten Vendrik and Frank Cörvers (2009) who found that there is a significant substitution effect of male and female participation and that the substitution effects from female was negative for male participation[44].

The findings further reveal that primary enrolment and inflation favorably affect FLFP in developing countries at 1 and 10% respectively, while secondary, tertiary enrolment as well as investment have adverse impacts on FLFP in developing countries. Their adverse effects are not significant except for investment which is significant at 5%.

[44] Maarten Vendrik and Frank Cörvers, "Male and Female Labour Force Participation: The Role of Dynamic Adjustments to Changes in Labour Demand, Government Policies and Autonomous Trends" *IZA Discussion Paper No. 4397* Bonn Germany (2009): 12

Table 5: Cross Section IV Regressions Results (Long Run Relationship)

	(1)	(2)	(3)	(4)	(5)	**Developed**	**Developing**
lgdpcap	-0.103***	-0.104***	-0.024	-0.038	-0.026	0.036	-0.139***
	(0.031)	(0.031)	(0.026)	(0.029)	(0.032)	(0.044)	(0.049)
lfert	-0.404***	-0.441***	-0.723***	-0.760***	-0.772***	-0.051	-0.804***
	(0.101)	(0.105)	(0.144)	(0.159)	(0.160)	(0.183)	(0.177)
llfprml		1.161***	0.603**	0.691**	0.756**	0.858	0.605
		(0.337)	(0.302)	(0.315)	(0.337)	(0.573)	(0.476)
lpri			0.425***	0.458***	0.427***	-0.226	0.492**
			(0.139)	(0.149)	(0.152)	(0.593)	(0.188)
lsec			-0.299***	-0.258***	-0.256***	-0.006	-0.187
			(0.080)	(0.089)	(0.095)	(0.164)	(0.167)
ltert			-0.089*	-0.104*	-0.107*	0.112**	-0.119
			(0.051)	(0.055)	(0.058)	(0.051)	(0.086)
linv				-0.205*	-0.201*	0.410***	-0.272**
				(0.116)	(0.117)	(0.142)	(0.136)
linfl					0.055	0.060	0.064*
					(0.034)	(0.046)	(0.037)
_cons	5.283***	0.251	1.818	1.934	1.594	-0.633	2.759
	(0.349)	(1.316)	(1.167)	(1.189)	(1.320)	(3.144)	(1.734)
R^2	.	0.04	0.15	0.16	0.17	0.45	0.34
N	166	166	162	160	156	49	107

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

In summing up the cross sectional results above; in developed countries fertility rate has a negative but a minor impact on FLFP rate in the long run since the impact is not statistically significant at 5%. However fertility has a major adverse impact on FLFP in developing countries in the long run considering the fact the impact if statistically significant at 1%. We therefore reject the null hypothesis stating that the effect of fertility on FLFP is the same for both advanced and less advanced countries. Because of the insignificance of the inverse sign, this research infers that the negative sign is losing its strength and may gradually turn positive in developed countries as posited by other researchers. This research agrees with the hypothesis that states an inverse relationship between birthrate and FLFP because of the conflicting duties of mother and

worker.[45] Fertility rate has a negative but minor impact whiles tertiary enrolment and investment have major impact on FLFP in advanced countries. MLFP has a positive but insignificant effect in both country categories in the long run. Whiles fertility rate, GDP per capita and primary enrolment are the major factors that significantly affects FLFP in developing countries. Tertiary enrolment, investment and inflation are the other factors that affect FLFP in developing countries.

4.2.1 Test of Validity of Instrumental Variables

A regression of the independent variables on the instruments is run to test the strength and validity of our instrumental variables used. The results are presented in table 18 and 19 (see appendix). The results show that the instruments and the dependent variables are strongly correlated with p values of 0.000, indicating that the instruments are valid and strong.

4.3.0 Short Run Relationship: Panel Regression Analysis

For panel regression analysis it is important to test whether random or fixed effect model will be give efficient and unbiased estimators, so we therefore employ the Hausman (1978) specification test to choose fixed or random effect model. The result is shown in table 6 below.

[45] Edward Bbaale, "Female Education, Labor-force Participation and Fertility: Evidence from Uganda", *African Economic Research Consortium, Nairobi-Kenya* (2014): 6

4.3.1: Hausman Specification Test between FE and RE Model

Table 6: Hausman Specification Test between FE and RE Model

	Coefficients of Fixed and Random Effect			
Variables	Fixed Effect (b)	Random Effect (B)	Difference (b-B)	S.E. Sqrt(diag(V_b -V_B))
GDP per capita	0.0239443	-0.0088692	0.0328136	0.0143591
Fertility rate	-0.1574078	-.1344571	-0.0229507	0.0130725
Male labor force participation	1.204972	1.129721	0.0752508	0.0424374
Female primary school enrolment	0.0230899	0.0561845	-0.0330946	0.003647
Female secondary school enrolment	-0.0526788	-0.0759675	0.0232888	0.0029085
Female tertiary school enrolment	0.0512522	0.0569645	-0.0057123	0.0045024
Investment	-0.0245697	-0.0231655	-0.0014042	0.0015544
Inflation	0.00008	0.0000615	0.0000185	3.53e-06

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 55.61

Prob>chi2 = 0.0000

(V_b-V_B is not positive definite)

The results above show a p-value of 0.0000 which is less than 0.05, and is highly significant, we therefore reject the null hypothesis that both RE and FE are consistent but the RE is more efficient. We therefore use fixed effect estimator for our analysis.

4.3.2 Short Run Relationship: Panel Fixed Effect Regression Results

In column 1 of table 7, the result shows that a 1% rise in GDP per capita will lead to 0.034% increase in FLFP with the effect being significant at 10%. It further shows that 1% rise in fertility will reduce FLFP by 0.173% at 1% level of significance.

The result in column 2 shows that the coefficient estimate, ($\beta_2 = 0.042$) of GDP per capita is positive and statistically significant at 5% level, this indicating that a 1% rise in per capita income will lead to a fall in FLFP by 0.042%. It further reveals that fertility rate has a negative and significant effect at 1%, indicating that 1% upward shift in fertility will reduce FLFP by 0.243% at 1% level of significance. Male labor force participation is positively related with FLFP at 1% significant, implying that a 1% rise in MLFP will raise FLFP by 1.145% at 1% level of significance.

In column 3 of table 7, the result shows that GDP per capita with an estimated value of 0.018 is positive but not significant at 10% level. It also shows that fertility rate has a negative effect on FLFP at 1% significant level, indicating that a 1% rise in fertility rate will make FLFP to fall by 0.159%. MLFP is positive and significant at 1%, and this indicates that a 1% rise in MLFP will increase FLFP by 1.268% at 1% level of significance. The coefficient estimates of primary and secondary enrolment both have a negative effect on FLFP with secondary being significant at 10% but primary enrolment is not significant. That of tertiary enrolment is positive and significant at 1%, implying that 1% increase in tertiary enrolment will raise FLFP by 0.048%.

Table 7 also shows in column 4 that the coefficient of GDP per capita rises FLFP but it is insignificant. It further reveals that fertility rate is negative and significant at 1% significant level, indicating that 1% rise in fertility rate will lead to a fall in FLFP by 0.158%. MLFP has a favorable and significant effect, indicating that a 1% rise in MLFP will raise FLFP by 1.263% at 1% level of significance. Primary and secondary enrolments are inversely related with FLFP, but secondary is significant only at 10% and primary is not. Tertiary enrolment has a major favorable (positive) and significant effect at 1%, meaning that a 1% increase in tertiary enrolment will

increase FLFP by 0.049%. Investment is adversely associated with FLFP and not significant at 10%.

Column 5 of table 7 shows that the coefficient estimate, fertility has a negative and significant effect on FLFP at 1% significant level, indicating that 1% upward shift in fertility rate will reduce FLFP by 0.157%. Male labor force participation positively affects FLFP and significant at 1% level. This implies that a 1% rise in MLFP leads to 1.205% rise in FLFP. Primary enrolment is positive and insignificant but secondary is negative and significant at 10%. The effect of tertiary enrolment on FLFP is positive and significant at 1%, indicating that when female tertiary enrolment increases by 1% their labor participation increases by 0.051%. Both investment and inflation have minor adverse effect at 10%. In all the five regressions the coefficient of fertility rate keeps decreasing and still significant at 1% while MLFP remains positive and significant at 1% after adding more control variables. This results show consistency

Subsamples Results:

1. ***Developed Countries***:

In column (6) of table 7 labeled developed, the result shows that a % rise in fertility will lead to 0.057% fall in FLFP with the effect being insignificant even at 10%. It further shows that a 1% rise in MLFP will raise FLFP by 1.546% at 1% level of significance. Primary enrolment and secondary are both positive but secondary is not significant and primary enrolment is significant at 1%. The result further indicates that tertiary enrolment is also has a favorable significant effect on FLFP at 1% level. Investment and inflation have a favorable influence at 5 and1% significance respectively, inflation is not economically significant.

2. Developing Countries:

In column 7 of table 7 labeled developing, the result shows that a 1% rise in fertility will lead to a 0.026% fall in FLFP at 1% level of significance in developing countries. It further shows that a 1% rise in MLFP will increase FLFP by 1.109% at 1% level of significance. Primary enrolment and secondary are positive and inverse respectfully and both are not significant. The result further indicates that tertiary enrolment, investment and inflation are all positive insignificant even at 10%.

Table 7: Short Run Relationship (Panel Fixed Effect Regressions Results)

	(1)	(2)	(3)	(4)	(5)	Developed	Developing
lgdpcap	0.034*	0.042**	0.018	0.022	0.024	0.011	-0.026
	(0.020)	(0.019)	(0.023)	(0.025)	(0.029)	(0.039)	(0.036)
lfert	-0.173***	-0.243***	-0.159***	-0.158***	-0.157***	-0.057	-0.229***
	(0.039)	(0.036)	(0.048)	(0.049)	(0.055)	(0.063)	(0.072)
llfprml		1.145***	1.268***	1.263***	1.205***	1.546***	1.109***
		(0.143)	(0.169)	(0.168)	(0.177)	(0.307)	(0.210)
lpri			-0.005	-0.000	0.023	0.317***	0.021
			(0.052)	(0.053)	(0.059)	(0.114)	(0.060)
lsec			-0.047*	-0.047*	-0.053*	0.043	-0.018
			(0.028)	(0.028)	(0.029)	(0.063)	(0.031)
ltert			0.048***	0.049***	0.051***	0.122***	0.019
			(0.011)	(0.011)	(0.015)	(0.026)	(0.015)
linv				-0.022	-0.025	-0.063**	0.008
				(0.023)	(0.023)	(0.027)	(0.027)
infl					0.000	0.000**	0.000
					(0.000)	(0.000)	(0.000)
_cons	3.910***	-1.092*	-1.462*	-1.432*	-1.263	-4.678***	-0.535
	(0.175)	(0.635)	(0.775)	(0.776)	(0.790)	(1.399)	(0.887)
R^2	0.13	0.31	0.32	0.32	0.31	0.60	0.30
N	811	811	578	566	527	197	330

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.3.3 Short Run Relationship: Panel IV Fixed Effect Regression Results

In column 1 of table 8, the result shows that a 1% rise in GDP per capita will lead to 0.05% increase in FLFP with the effect being significant at 1%. It further shows that a 1% rise in fertility will reduce FLFP by 0.154% at 1% level of significance in the short run.

Column 2 shows that the coefficient estimate GDP per capita has a favorable and significant effect on FLFP at 1% level, indicating that a 1% improvement in per capita income will increase FLFP by 0.052 at 1%. It further reveals that fertility rate has a negative and significant effect at 1%, indicating that a 1% rise in fertility will lead to a fall in FLFP by 0.234% at 1% level of significance. Male labor force participation is positively related with FLFP at 1% significant, implying that a 1% rise in MLFP will raise FLFP by 1.138% at 1% level of significance.

In column 3 of table 8, the result shows that GDP per capita with an estimated value of 0.032 has an insignificant favorably influences FLFP at 10% level. It also shows that fertility rate has a negative effect on FLFP at 1% significant level, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.14%. Male labor force participation continues its significant positive impact at 1%, and this indicates that a 1% rise in MLFP will increase FLFP by 1.282% at 1% level of significance. The coefficient estimates of primary and secondary enrolment both have an adverse but insignificant effect on FLFP. That of tertiary enrolment is positive and significant at 1%, implying that 1% increase in tertiary enrolment will raise FLFP by 0.045%.

The result in column 4 shows that the coefficient GDP capita rises FLFP by 0.034 at 10% significant level. It further reveals that fertility rate has an adverse significant effect on FLFP at 1% significant level, indicating that a 1% upward shift in fertility rate will reduce FLFP by 0.141%. Male labor force has a favorable significant effect on FLFP, indicating that a 1% upward shift in MLFP will raise FLFP by 1.279% at 1% level of significance. This finding is in contrast to the research by Maarten Vendrik and Frank Cörvers (2009) who found a substitution effect exist between male and female participation and that the substitution effects from female was negative for male.[46] Primary and secondary enrolments are all have adverse but insignificant effects.

[46] Maarten Vendrik and Frank Cörvers, "Male and Female Labour Force Participation: The

Tertiary enrolment has a positive and a major effect at 1%, meaning that a 1% increase in tertiary enrolment will increase FLFP by 0.048%. Investment also has an adverse but minor effect at 10%.

The result in column 5 shows that the estimated value of fertility has a negative and major effect on FLFP at 1% significant level, indicating that 1% upward shift in fertility rate will reduce FLFP by 0.147% at 1% level of significance. Male labor force participation has a favorable and 1% significant effect on FLFP. This implies that a 1% rise in MLFP leads to 1.221% rise in FLFP in the short run. Primary enrolment is positive and insignificant but secondary has adverse and also insignificant effect. The effect of tertiary enrolment on FLFP is a major positive one at 1% significant level, indicating that when female tertiary enrolment increases by 1% their labor participation increases by 0.050%. Investment has an insignificant adverse effect at 10% while inflation is positive and statistically but not economically significant. In all the five columns the coefficient of fertility rate remains negative but still significant at 1% while that of MLFP also remains positive and significant at 1% after adding more control variables. This results show consistency

Subsamples Results:

1. ***Developed Countries***:

In column (6) of table 8 labeled developed, the result shows that the positive effect of rising per capita is not significant. It shows further that, a 1% rise in fertility will lead to 0.043% insignificant decrease in FLFP. It further reveals that a 1% rise in MLFP will increase FLFP by 1.605% at 1% level of significance. Primary enrolment and tertiary enrolments are positive and

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Role of Dynamic Adjustments to Changes in Labour Demand, Government Policies and Autonomous Trends" *IZA Discussion Paper No. 4397* Bonn Germany (2009): 12.

significant at 5 and 1% respectively in the short run, but secondary enrolment is insignificant. Investment has an adverse effect on FLFP at 5% significant level, while inflation has a favorable effect at 10% statistically significant but economically not significant.

2. Developing Countries:

In column 7 of table 8 labeled developing, the result shows that a 1% upward shift in fertility will lead to a 0.231% decrease in FLFP at 1% level of significance in developing countries. It further shows that a 1% rise in MLFP will increase FLFP by 1.127% at 1% level of significance in the short run. Primary enrolment, secondary, tertiary investment and inflation all have favorable but insignificant impact on FLFP in developing countries in the short run.

In rapping up the results of panel IV fixed effect regression; the study reveals that in developed countries fertility rate has an adverse but a minor impact on FLFP rate since the impact is insignificant even at 10%. However fertility has an adverse and a major impact on FLFP rate in developing countries in the short run. Specifically, in developing countries, a 1% increase in fertility rate will decrease FLFP rate by 0.231%, at 1% significant level. The a priori statement of mutually exclusive events that states an inverses relationship between fertility and FLFP due to the difficulty in being a mother and a worker at the same time[47] still holds as per this research paper especially for developing countries case. Male labor force participation has a major impact on FLFP in both developed and developing countries. Fertility rate has a negative but minor impact whiles primary, tertiary enrolment and investment have major impact on FLFP in developed countries.

[47] Ibid.

Table 8: Short Run Relationship (Panel IV Fixed Effects Regressions Results)

	(1)	(2)	(3)	(4)	(5)	Developed	Developing
lgdpcap	0.050***	0.052***	0.032	0.034*	0.029	0.033	-0.032
	(0.014)	(0.013)	(0.020)	(0.021)	(0.023)	(0.033)	(0.032)
lfert	-0.154***	-0.234***	-0.140***	-0.141***	-0.147***	-0.043	-0.231***
	(0.025)	(0.023)	(0.035)	(0.036)	(0.040)	(0.056)	(0.050)
llfprml		1.138***	1.282***	1.279***	1.221***	1.605***	1.127***
		(0.097)	(0.129)	(0.129)	(0.135)	(0.266)	(0.154)
lpri			-0.020	-0.014	0.009	0.304**	0.006
			(0.037)	(0.038)	(0.041)	(0.154)	(0.044)
lsec			-0.029	-0.032	-0.037	0.076	0.000
			(0.026)	(0.026)	(0.026)	(0.064)	(0.031)
ltert			0.045***	0.048***	0.050***	0.112***	0.015
			(0.011)	(0.011)	(0.013)	(0.022)	(0.015)
linv				-0.024	-0.026	-0.069**	0.010
				(0.017)	(0.018)	(0.030)	(0.021)
infl					0.000**	0.000*	0.000
					(0.000)	(0.000)	(0.000)
_cons	3.760***	-1.153***	-1.652***	-1.600***	-1.374**	-5.190***	-0.561
	(0.129)	(0.442)	(0.603)	(0.603)	(0.609)	(1.426)	(0.705)
N	811	811	578	566	527	197	330

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.4.0 Formal Test(s) if Fertility Effect Significantly Differ Between Sub Groups

Table 9 below shows the result of a two sample group mean test to formally test if the fertility effects differs in advanced and less advanced countries. The results show that fertility differs in advanced and less advanced countries by 0.7073957. Considering the p-values of the second and third alternate hypothesis we find that fertility differs in advanced and less advanced countries and the difference is greater than zero (0). We therefore reject the null hypothesis stating no significant difference in advanced and less advanced countries.

Table 9: Two-Sample T Test with Unequal Variances (Two Sample Group Mean)

Group	Observation	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	977	1.372532	.0148439	.463976	1.343403	1.401662
1	483	0.6651365	.0152372	.3348714	.635197	.695076
combined	1460	1.13851	.01414	.540287	1.110773	1.166247
diff		.7073957	.0212724		.6656628	.7491286

diff = mean(0) - mean(1) t = 33.2542

Ho: diff = 0 Satterthwaite's degrees of freedom = 1267.31

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

We also carried out a second test of difference by regressing developed dummy on fertility and the results shows that the fertility differs in advanced and less advanced countries by (0.7073957) which is the same as two sample group mean test of difference. This results implies that the impact of birth rate on FLFP is lower in advanced countries by 0.7073957 compared to less advanced countries. (See table 15 in appendix).

4.4.1 Formal Test(s) if the Effect of MLFP Significantly Differ in Advanced and Less Advanced Countries

Table 10 below shows the result of a two sample group mean test to formally test if the male labor market involvement effects have significant difference in advanced and less advanced countries. The results show that male labor market involvement differs in advanced and less advanced countries by 0.0131982. Considering the p-values of all the hypothesis we find that there is no significant difference between advanced and less advanced countries and we therefore fail to reject the null hypothesis stating no significant

difference of the effects of male labor market involvement between advanced and less advanced countries.

Table 10: Two-Sample T Test with Unequal Variances (Two Sample Group Mean)

Group	Observation	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	114	4.380655	.0080513	.0859645	4.364703	4.396606
1	56	4.367456	. 0095496	.0714628	4.348319	4.386594
combined	170	4.376307	.0062506	.0814978	4.363968	4.388646
diff		.0131982	.0124907		-.0115147	.0379111

diff = mean(0) - mean(1) t = 1.0566

Ho: diff = 0 Satterthwaite's degrees of freedom = 129.205

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.8537 Pr(|T| > |t|) = 0.2926 Pr(T > t) = 0.1463

We also carried out a second test of difference by regressing developed dummy on male labor market involvement and the results shows that the difference between advanced and less advanced countries is (0.0131982) which is the same as two sample group mean test of difference. Considering a P>|t| of 0.322, we therefore fail to reject the null hypothesis stating no significant difference of the effects of male labor market involvement between advanced and less advanced countries. (See table 16 in appendix).

4.5.0 Long Run Relationship for SSA and ODCs: Cross Sectional OLS and IV Regression Results

Table 11 below shows the cross sectional, including IV regression results for Sub Saharan Africa and other developing countries.

Column 3 of table 11 shows the cross sectional result for SSA. The result shows that fertility has an inverse and significant effect on FLFP at 5% level of significance, indicating that a 1% rise in fertility will lead to a 1.087% decrease in FLFP in SSA. It also shows that the MLFP rate has a positive but no significant impact on FLFP at 10%. It further shows that the interaction of fertility and female primary school enrolment is positive and significant at 1% significant level, indicating that when mothers with primary school education increases by 1%, FLFP rate will increase by 0.257% at 1% significant level in SSA. This result could also be interpreted as; increase in female primary school enrolment rate (including children) leads to increase in FLFP. Surprisingly the interaction between secondary, tertiary enrolment and fertility has an adverse effect on FLFP even though secondary is insignificant even at 10%. That of tertiary enrolment is significant at 5%.

Column 4 of table 11 also shows the cross sectional result for ODCs. The result shows that fertility has an inverse and significant effect on FLFP at 5% level of significance, indicating that a 1% upward shift in fertility will lead to a 2.234% decrease in FLFP in ODCs. It can be noted that the impact of fertility is greater in ODCs than SSA considering the fact the coefficient estimates is for ODCs is greater than SSA by 1.147%. The results further reveal that the male labor market involvement rate has a positive and a 10% significant impact on FLFP in ODCs. Again, MLFP has much a greater positive impact in ODCs than in SSA. It further shows that the interaction of fertility and female primary school enrolment has a favorable effect on FLFP and significant at 1% significant level, indicating that when mothers with primary school education increases by 1%, FLFP will increase by 0.444% at 1% significant level in ODCs. Even though in SSA mother's primary school enrolment has a greater impact than in ODCs, the level of

significant is lower for SSA and higher for ODCs. That of tertiary enrolment is significant for ODCs but not significant for SSA despite the fact it has an adverse effect in both categories.

Column 5 of table 11 shows the cross sectional IV result for SSA. The result shows that fertility has an inverse and significant effect on FLFP at 10% level of significance, indicating that a 1% rise in fertility will lead to a 1.13% fall in FLFP in SSA in the long run. It also shows that the male labor market involvement rate has a positive but no significant impact on FLFP at 10%. It further shows that the interaction of fertility and female primary school enrolment has a favorable effect on FLFP and significant at 1% significant level, indicating that when mothers with primary school education increases by 1%, FLFP rate will increase by 0.262% at 1% significant level in Sub Sahara Africa. That of secondary and tertiary enrolments are both negative but only tertiary is significant at 10% level of significance.

Column 6 of table 11 shows the cross sectional IV result for ODCs. The result shows that fertility has an adverse significant effect on FLFP in ODCs, indicating that a 1% rise in fertility will lead to a 4.721 fall in FLFP at 5% significant level. It further shows that the interaction of fertility and female primary school enrolment has a favorable effect on FLFP and significant at 1% significant level, indicating that when mothers with primary school education increase by 1% female labor market participation will increase by 1.064% at 1% significant level in ODCs in the long run. The results imply that fertility has a greater adverse effect on FLFP in other developing countries than in Sub Saharan African countries. In addition, the results show that the effect of mothers having primary school education has much greater impact in other developing countries than in Sub Saharan African Countries despite the fact it has a significant positive impact in both categories. In terms of importance mothers primary education is more important in SSA than in ODCs considering the significance levels.

Table 11: Long Run Relationship: Cross Section Results for SSA and ODC

			OLS Results		2SLS (IV Results)	
			SSA	ODCs	(5) SSA	(6) ODCs
	(1)	(2)	(3)	(4)		
lgdpcap	-0.087	-0.114**	-0.087	-0.183***	-0.091	-0.241***
	(0.055)	(0.050)	(0.056)	(0.050)	(0.072)	(0.072)
lfert	0.083	-0.951**	-1.087**	-2.234**	-1.130*	-4.721**
	(0.229)	(0.379)	(0.432)	(0.896)	(0.630)	(2.132)
llfprml	0.658	0.272	0.546	1.173*	0.541	0.616
	(0.406)	(0.422)	(0.453)	(0.631)	(0.445)	(0.585)
fet*pri		0.261***	0.257***	0.444**	0.262***	1.064**
		(0.081)	(0.084)	(0.211)	(0.093)	(0.510)
fet*sec		-0.061	-0.027	-0.053	-0.027	-0.139
		(0.063)	(0.071)	(0.132)	(0.071)	(0.144)
fe*tert		-0.054*	-0.071**	-0.073	-0.072*	-0.112
		(0.030)	(0.034)	(0.062)	(0.037)	(0.077)
linv			-0.228*	-0.142	-0.231*	-0.257
			(0.122)	(0.245)	(0.132)	(0.339)
_cons	1.616	3.656	3.059	1.140	3.152	4.487
	(2.187)	(2.179)	(2.284)	(2.780)	(2.379)	(3.056)
R^2	0.18	0.41	0.46	0.33	0.46	0.20
N	44	43	43	70	43	70

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.5.1 Short Run Relationship for SSA and ODCs: Panel FE and IV Results

Table 12 below shows the panel fixed effect, including panel IV FE regression results for SSA and ODCs.

Column 3 of table 12 shows the panel FE result for SSA. The result reveals that fertility has an inverse and significant effect on FLFP at 5% level of significance, indicating that a 1% upward shift in fertility will lead to a 0.324% at 5% decrease in FLFP in SSA. It also shows that the male labor market involvement rate favorably affect FLFP at 1%, indicating that a 1% rise in MLFP rate will lead to a 0.705% rise in FLFP in SSA in the short run. None of the other variables has a major impact on FLFP in SSA in the short run.

Column 4 of table 12 shows the panel FE result for ODCs. The result shows that fertility has a non-significant adverse effect on FLFP in ODCs in the very near future. It also reveals that MLFP has a favorable significant effect on FLFP in ODCs, specifically a 1% rise in MLFP will raise FLFP by 1.390% at 1% level of significance. It further shows that the interaction of fertility and female tertiary school enrolment favors FLFP and significant at 5% significant level, indicating that when mothers with tertiary school education increases by 1% FLFP will increase by 0.030% at 5% significant level in ODCs in the short run. The rest are all insignificant.

Column (5) of table 12 shows the panel IV FE result for SSA. The result shows that fertility has a significant adverse effect on FLFP at 1% level, implying that a 1% rise in fertility rate will lead to a fall in FLFP by 0.350% at 1% significant level. It also shows that MLFP has favorable significant effect on FLFP in SSA, indicating that a 1% rise in MLFP will increase FLFP by 0.706% at 1% significant level. The interaction term of fertility and all the educational variables are not significant. Investment is not also significant in the short run.

Column 6 of table 12 shows the panel IV FE result for ODCs. The result shows that fertility has an adverse but no significant effect on FLFP. It also shows that MLFP has a favorable significant effect on FLFP in ODCs in the short run, indicating that a 1% rise in MLFP will increase FLFP rate by 1.386% at 1% level of significance. It further reveals that the interaction of fertility and female tertiary school enrolment also has a favorable effect on FLFP and significant at 1% significant level, indicating that when mothers with tertiary school education increases by 1% FLFP will increase by 0.032% at 5% significant level in ODCs in the short run. The rest of the variables are insignificant.

The results imply that fertility has a greater adverse effect on FLFP in ODCs than in SSA both in the short and long run. It further imply that the MLFP also has a favorable major effect in

ODCs than in SSA despite the fact that it is highly significant in both categories in the short run but has no significant impact in the long run for both SSA and ODCs. The effects of mothers having tertiary education has a major positive impact in other developing countries and a minor favorable impact in Sub Saharan African countries in the short run. However it has an adverse but less significant effect on FLFP in the long run in both categories. The long run effect of mothers having primary education on FLFP is favorable and highly significant in both SSA and ODCs but has a favorable and insignificant impact in the short run.

Table 12: Panel Fixed and Panel IV Fixed Regression Results for SSA and ODCs (Short Run Relationship)

			Panel Fixed Results		IV Results	
	(1)	(2)	(3) SSA	(4) ODCs	(5) SSA	(6) ODCs
lgdpcap	-0.048*	-0.075	-0.074	0.015	-0.075	0.015
	(0.025)	(0.049)	(0.049)	(0.027)	(0.049)	(0.027)
lfert	-0.300***	-0.362***	-0.324**	-0.188	-0.350***	-0.113
	(0.045)	(0.115)	(0.124)	(0.193)	(0.128)	(0.340)
llfprml	0.567***	0.727***	0.705***	1.390***	0.706***	1.386***
	(0.147)	(0.215)	(0.218)	(0.171)	(0.219)	(0.172)
fert*pri		0.035	0.030	0.023	0.033	0.006
		(0.024)	(0.025)	(0.052)	(0.026)	(0.083)
fet*sec		-0.002	-0.002	-0.054	-0.002	-0.053
		(0.018)	(0.018)	(0.037)	(0.018)	(0.037)
fe*tert		0.001	0.002	0.030**	0.001	0.032**
		(0.010)	(0.011)	(0.014)	(0.011)	(0.016)
linv			0.019	-0.036	0.018	-0.035
			(0.024)	(0.027)	(0.024)	(0.027)
_cons	2.409***	1.724*	1.732*	-2.110**	1.759*	-2.098**
	(0.656)	(0.988)	(1.000)	(0.814)	(1.001)	(0.816)
R^2	0.24	0.27	0.27	0.40		
N	218	134	133	234	133	234

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

4.6.0 Formal Test(S) if Fertility Significantly Differ Between Sub Sahara Africa and Other Developing Countries

The table 13 below shows the result of a two sample group mean test to formally test if fertility effects have significant differences between SSA and ODCs. The results from table 13 show that the mean difference between SSA and ODCs is -0.5455602. Considering the p-values of the first and second alternate hypothesis we find significant difference in SSA and ODCs, and the difference is less than zero (0). We therefore reject the null hypothesis stating no difference in SSA and ODCs.

Table 13: Two-Sample T Test with Unequal Variances (Two Sample Group Mean)

Group	Observation	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	82	1.183792	0.0378326	0.3425887	1.108517	1.259067
1	47	1.729352	0.0365093	0.2502951	1.655863	1.802841
combined	129	1.382562	0.0358999	0.4077442	1.311528	1.453596
diff		-0.5455602	0.052576		-.649661	-.4414594

diff = mean(0) - mean(1) t = -10.3766

Ho: diff = 0 Satterthwaite's degrees of freedom = 119.548

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

We also carried out a second test of difference by regressing Sub Sahara Africa dummy on fertility and the results show a difference of 0.5455602 in SSA and ODCs which is the same as the result of the two sample group mean test of difference above. These results imply that fertility rate will be lower in Sub Saharan Africa countries by 0.5455602 compared to other developing countries in the long run. (See table 17 in appendix)

4.6.1 Formal Test(s) if MLFP Significantly Differ in SSA and ODCs

Table 14 below shows the result of a two sample group mean test to formally test if male labor force participation effects have significant differences in SSA and ODCs. The results show that the mean difference between SSA and ODCs is -0.0039439. Considering the p-values of all the alternate hypotheses we find no difference in SSA and ODCs, and therefore fail to reject the null hypothesis stating no difference of the impact of male labor force participation rate between Sub Saharan Africa and other developing countries.

Table 14: Two-Sample T Test with Unequal Variances (Two Sample Group Mean)

Group	Observation	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	75	4.372126	0.0090398	0.0782867	4.354114	4.390139
1	45	4.37607	0.0145967	0.0979175	4.346653	4.405488
combined	120	4.373605	0.0078315	0.0857901	4.358098	4.389113
diff		-0.0039439	0.0171692		-.038129	-.0302411

diff. = mean (0) - mean (1) t = -0.2297

Ho: diff = 0 Satterthwaite's degrees of freedom = 77.4495

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.4095 Pr(|T| > |t|) = 0.8189 Pr(T > t) = 0.5905

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND POLICY IMPLICATION

5.1.0 Summary and Conclusion

The study finds out whether fertility and male labor force participation rate have significant positive or negative impact on FLFP. Even though there are few cases that show favorable impact of fertility on FLFP, the study finds that fertility has an adverse impact on FLFP both in advanced and less advanced countries.

Using data on 196 advanced and less advanced countries (full sample) and 130 less advanced countries (sub sample) over the period of 1974-2013, we find that fertility rate has significantly different impacts on FLFP in advanced and less advanced countries. Fertility has an adverse effect on FLFP rate in both advanced and less advanced countries. However it has a significantly adverse effect on FLFP in less advanced countries both in the short and long run, and a minor effect on FLFP rate in less advanced countries both in the short and long run. One of the findings of this research is that MLFP rate has a significant and economic positive impact on FLFP in the short run both in advanced and less advanced countries. But the positive impact does not translate into the long run. This is in contrast to the research by Maarten Vendrik and Frank Cörvers (2009) who found a significant substitution effect of male and FLFP, and that the substitution effect from females was negative for male participation.[48]

For the case of less advanced countries: fertility has a major adverse effect on FLFP in SSA and an adverse but insignificant effect in ODCs in the short run. However the results are different in the long run where fertility has insignificant negative impact in Sub Saharan Africa

[48] Maarten Vendrik and Frank Cörvers, "Male and Female Labour Force Participation: The Role of Dynamic Adjustments to Changes in Labour Demand, Government Policies and Autonomous Trends" *IZA Discussion Paper No. 4397* Bonn Germany (2009): 12

but has significant negative impact in other developing countries. Another finding which is contrary to the researcher's a priori expectation is that MLFP has a significant positive effect on FLFP rate in the short run both in SSA and ODCs. The impact is greater for other developing countries in the short run. The long run effects of mothers attaining primary education is an increase in FLFP both in categories.

These results will undoubtedly help equip policy makers to understand the dynamics of fertility rate, male labor market involvement and female labor market involvement to enable them predict changes in these variables and the future, especially in developing countries. To be more precise, if fertility rate has an adverse (negative) impact on FLFP then it would be appropriate to focus on policies targeting the reduction of the adverse effects of fertility on FLFP rate especially in developing countries. Male labor market involvement should not be seen as competing with women for scarce jobs as posited by Maarten Vendrik and Frank Cörvers (2009).[49]

5.2.0 Policy Implication

In conclusion, the study suggests that policies towards supporting female education especially tertiary education in both developing and developed countries should be formulated. In addition to that, family friendly policies such as tax incentives for working mothers, bonuses, and encouraging employers to employ mothers who are willing to work should be implemented. Access to female part time jobs and childcare support services policies which have been found by other research to reduce the adverse effects of fertility on female labor force participation in developed countries should be encouraged and continued. Developing countries can also start thinking of family friendly policies to enable mothers to work without difficulty. Discriminatory

[49] Ibid.

labor policies against men should be avoided since male participation in the labor market increases female's as well.

In Sub Saharan Africa female primary school enrolment should be encouraged and policies to induce mothers with tertiary education to participate in the work force should be formulated and implemented.

APPENDIX

Figure 3: Scatter plot of Female labor force participation rate and fertility rate.

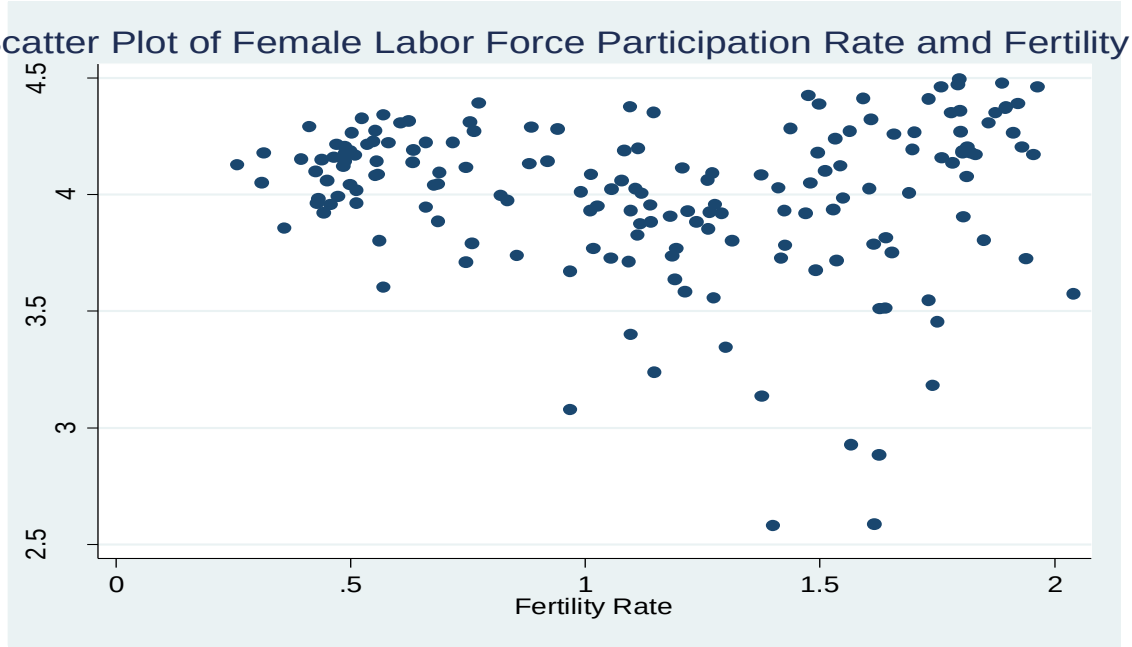

Figure 4: Scatter plot of Female labor force participation rate and fertility rate.

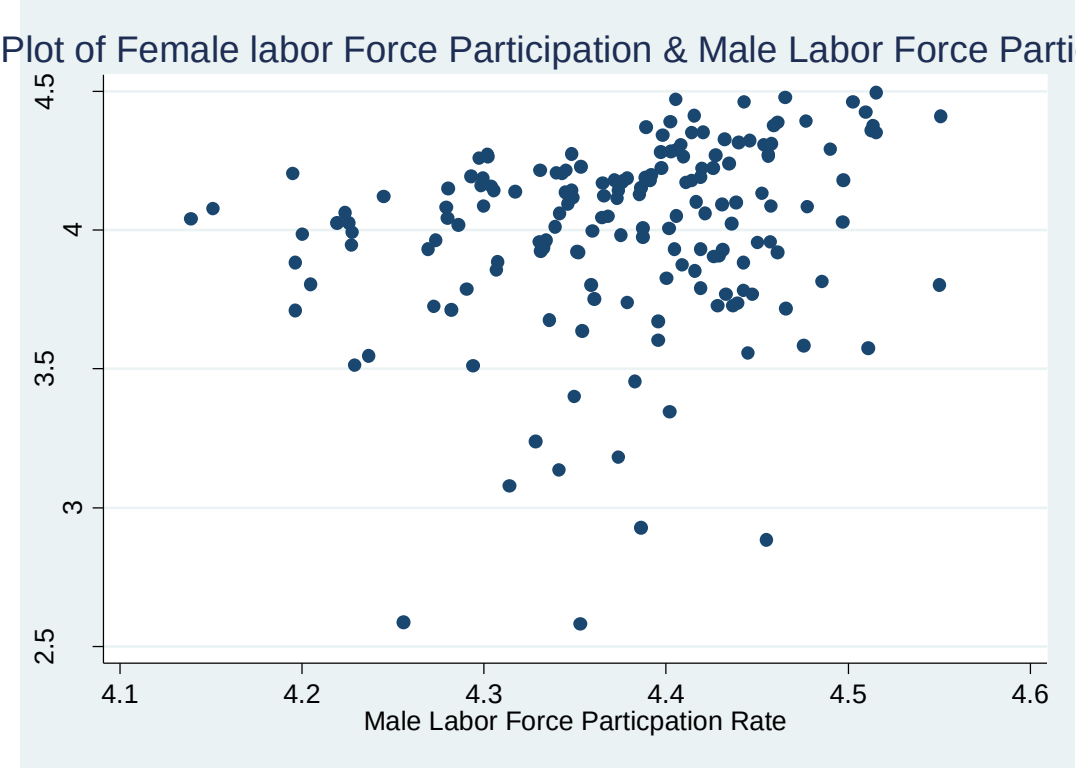

Table 15: Regressing Developed Dummy on Fertility

Source	SS	df	MS
Model	161.738599	1	161.738599
Residual	264.158109	1458	0.181178402
Total	425.896708	1459	0.291910013

Number of obs = 1460
F (1, 1458) = 892.70
Prob > F = 0.0000
R-squared = 0.3798
Adj R-squared = 0.3793
Root MSE = 0.42565

lfert	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
developed	-0.7073957	0.023676	-29.88	0.000	-0.7538384 -0.660953
_cons	1.372532	0.0136178	100.79	0.000	1.34582 1.399245

Table 16: Regressing Developed Dummy on Male Labor Force.

Source	SS	df	MS
Model	0.0065414	1	161.738599
Residual	1.115937	168	0.181178402
Total	1.1224801	169	0.291910013

Number of obs = 170
F (1, 1458) = 0.98
Prob > F = 0.3224
R-squared = 0.0058
Adj R-squared = 0.0001
Root MSE = 0.0815

llfprml	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
developed	-0.0131982	0.0132998	-0.99	0.3224	-0. 0394544 0. 013058
_cons	4.380655	0.0076333	573.89	0.000	4.3655851 4.395724

Table 17: Regressing Sub Sahara (r6 Dummy) on Fertility

Source	SS	df	MS
Model	8.89216058	1	8.89216058
Residual	12.3885212	127	0.097547411
Total	21.2806818	128	0.166255326

Number of obs = 129
F (1, 1458) = 91.16
Prob > F = 0.0000
R-squared = 0.4179
Adj R-squared = 0.4133
Root MSE = 0.3123

lfert	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]
R6	0.5455602	0.0571409	9.55	0.000	0.4324887 0.6586316
_cons	1.183792	0.0344906	34.32	0.000	1.115541 1.252043

Table 18: Regressing IV on Fertility

Number of obs = 190
F (1, 188) = 1121.11
Prob > F = 0.0000
R-squared = 0.8564
Adj R-squared = 0.8556
Root MSE = 0.19099

Source	SS	df	MS
Model	40.8966244	1	40.8966244
Residual	6.85796745	188	0.03647855
Total	47.7545918	189	0.252669798

lfert	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
ilfert	0.9103457	0.0271883	33.48	0.000	0.8567125	0.963979
_cons	-0.1667928	0.0407761	-4.09	0.000	-0.2472303	-0.0863554

Table 19: Regressing IV on Male labor Force Participation.

Number of obs = 170
F (1, 188) = 611.79
Prob > F = 0.0000
R-squared = 0.7846
Adj R-squared = 0.3794
Root MSE = 0.19099

Source	SS	df	MS
Model	0.8806514	1	0.88065141
Residual	0.24182868	168	0.00143946
Total	1.12248009	169	0.006641894

llfprml	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
illfprml	0. 8973435	0. 0362791	24.73	0.000	0. 8257219	0. 9689651
_cons	0. 4334761	0. 1594328	2.72	0.007	0. 1187262	0. 7482260

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